

# **Ecological Assessment and Impact Assessment for 380 Wilson Mountain Road**

Prepared by:

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Final

## **Acknowledgements**

The author would like to thank Dwight Shanner of Aarde Environmental for conducting a site review and providing insightful hydrology comments. Allison Haney prepared the ecosystem mapping and provided her insights into the ecology of the area.

## Introduction

The 15.78 hectare parcel of land situated at 380 Wilson Mountain Road is situated on the north side of Oliver Mountain, off Willowbrook Road. Like many of the properties in the Fairview area, this is a Crown-granted mineral claim (KT 1665 000548, 00548A). The owner of the property, Alfred Auclair, has been renting the property to Ron Ethier (and his partner, Veronica Eadie) with a rent-to-purchase agreement. The renters have exercised some autonomy on the land, with assurances that they will soon be able to become the new owners. As such, they are the clients in this process.

The clients applied for a temporary use permit from the RDOS for outdoor storage facility (RDOS File: C2022 022-TUP). The clients hope that this would provide a retirement income.

Prior to the submission of the temporary use permit, the clients had conducted earthworks which included leveling and adding fill to a meadow area, as well as the excavation and backfilling of two small ponds within the meadow area. They stated that they were unaware that this portion of the parcel was designated as an Environmentally Sensitive Development Permit Area (ESDPA) and that specific protocol would have been required and approved by the Regional District of Okanagan-Similkameen (RDOS 2023), prior to any alteration of the ESDPA area. The location of the property and the ESDPA area are presented in Figure 1.

This assessment describes the potential values of the ESDPA area that has been disturbed and, to a lesser extent, the values of the surrounding land which have not been impacted to date. Remediation of the site is limited, due to soil compaction and the suspected changes in the hydrology of the site. However, it is believed that a ditch pond along the southern edge of the meadow area may provide similar habitat values as the two original ponds. Restoration of the meadow area is not deemed practical but could naturalize over time with the assistance of pocket gopher diggings.

**Table 1: Tombstone parcel information for 380 Wilson Mountain Road**

<b>Civic Address</b>	380 Wilson Mtn Rd
<b>PID</b>	014-783-754
<b>Legal Description</b>	DL 548, SDYD, Except Plan 34109, Surface WHITE SWAN MC not included within DL 331S
<b>Area</b>	15.75 ha (38.9 ac)
<b>Zoning Designation(s)</b>	LH1, Site Specific: <Null> RA, Site Specific: <Null>
<b>Zoning Bylaw</b>	2800
<b>Agricultural Land Reserve</b>	No
<b>Crown Granted Mineral Claim</b>	KT 1665 000548, 00548A

# Part 1: Ecological Assessment

## Overview

The parcel at 380 Wilson Mountain Road lies within the very hot and dry subvariant of the Ponderosa Pine (PPxh1) biogeoclimatic subzone and within the South Okanogan Basin (SOB) ecosection. The property lies along the northern toe of Oliver Mountain (summit elev asl 720 m). The elevation of the subject property ranges from 500 to 530m (asl). The property is 15.78 ha in size and is positioned on undulating bedrock, creating two distinct zones. The perched bedrock areas have very shallow moraine soils with little topsoil development and are dominated by ponderosa pine, antelope brush and bluebunch wheatgrass. The low lying areas are actually a series of basins with moraine soils and an overlying relatively deep organic layer that forms a meadow ecosystem. Meadow sites in the south Okanogan are now typically vegetated with non-native species (e.g. Kentucky bluegrass) but often still provide important habitat values.

Access roads and residential building sites were the only conspicuous disturbances on the property, prior to 2018, which is reflected in the delineation of the ESDPA boundaries, currently used by the RDOS (Figure 1). The remainder of the property is currently considered ‘environmentally sensitive’, and subject to the ESDPA process, that requires an environmental assessment before land or vegetation alterations commence (RDOS 2023).

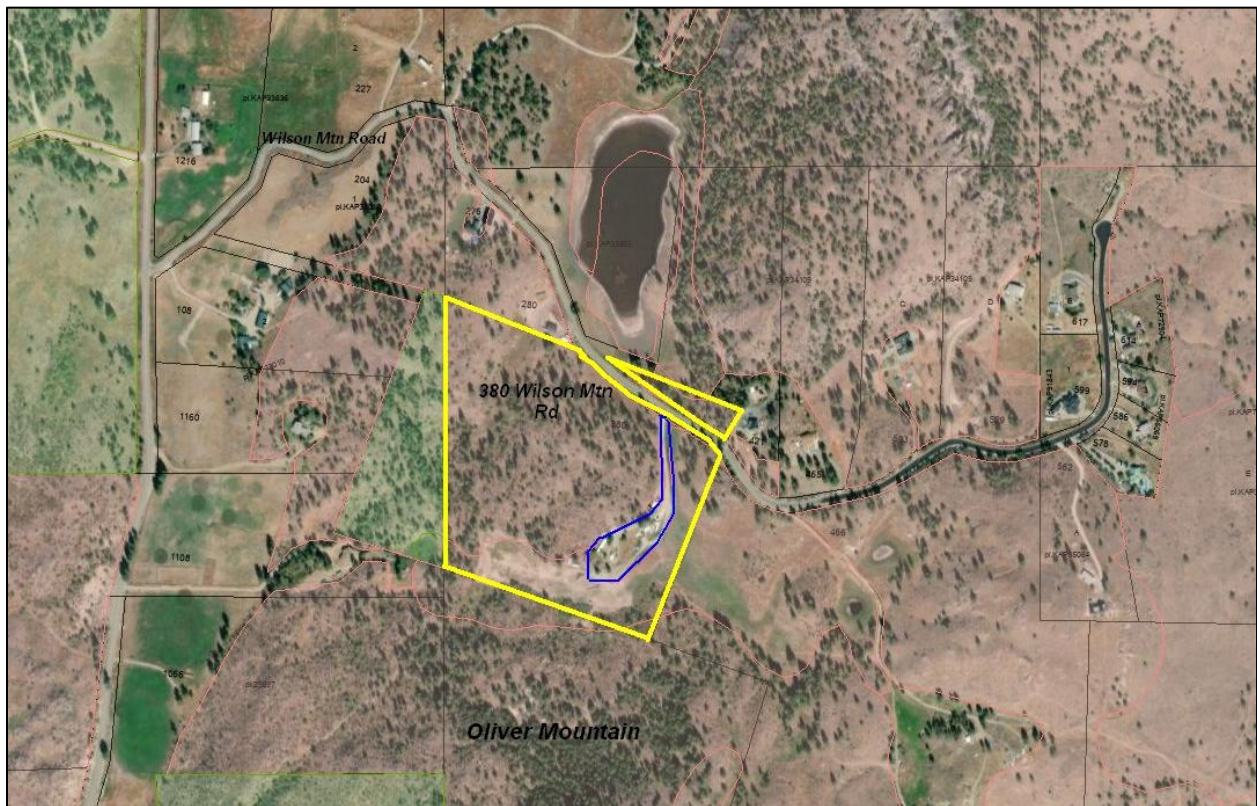


Figure 1: Location of 380 Wilson Mountain Road off of Willowbrook Road and ESDPA exclusion area outlined in blue (adapted from RDOS map server).

## Ecological Communities and ESA Designations

Ecosystem mapping of the Okanagan has been prepared by a sequence of various investigators but summarized as Sensitive Ecosystems of the Okanagan Valley (Iverson et. al. 2008) and adopted by municipal governments to guide future development. The mapping was developed at a 1:20,000 scale and was verified by representative field truthing. Soil and terrain form the bases for the polygon delineation and then vegetation communities are subsequently described and ecosystem units are applied. Habitat associations for wildlife species of concern ultimately contribute to the assignment of the Sensitive Ecosystems.

Environmentally Sensitive Area (ESA) designations, using a 4-tiered ranking, has been adopted by municipal governments to highlight the perceived importance of a specific ecological community, based on its habitat value and rarity. Values of one through four have been applied to each ecological community. Basically, an ESA value of four would mean that there are few merits that should influence the retention of areas with this designation, whereas an ESA value of one would either require avoidance or significant mitigation if there were impacts to ecological communities with this ranking.

Figure 3 provides a depiction of the ecological communities within the subject parcel. Discussion of these communities has been divided into the upland portions (mostly in the northwest) and lowland portions (mostly in the southeast). The original mapping for this area was near the edge of an air photo set so the ortho-restitution resulted in many of the polygon boundaries being slightly offset from the current air photo delineation (A. Haney pers. comm.). Arrow wedges have been added to show the direction in which polygon boundaries should be shifted to create a more exact representation of ecosystem boundaries.

The upland (arid) portions of the property occur primarily in the northwest section of the property. There are two predominant ecosystems present, both with ponderosa pine as the leading tree species. The Pine-Three Awn (PT; see Figure 2) is the most arid of these two ecosystems and has very shallow soils over bedrock and poorly developed organic layer. The pines are mostly young in this area due to past fire events (e.g. the 1969) fire. The dominant bunchgrasses are three-awn and bluebunch wheatgrass. Precipitation sheds quickly off of these slopes due to the shallow soils. The other dominant ecosystem in the upland area is the Pine – Wheatgrass (PW) ecosystem, which occurs in shallow ravines in the area. Both moisture and topsoil accumulate in these gullies, creating a slightly lush environment. There are some older pines in these areas and a more diverse shrub component. However, both of these ecosystems contain healthy stands of antelope brush and therefore qualify as an ESA 1.

**Figure 2: Pine – three awn ecosystem on the subject property with an abundance of Antelope Brush.**



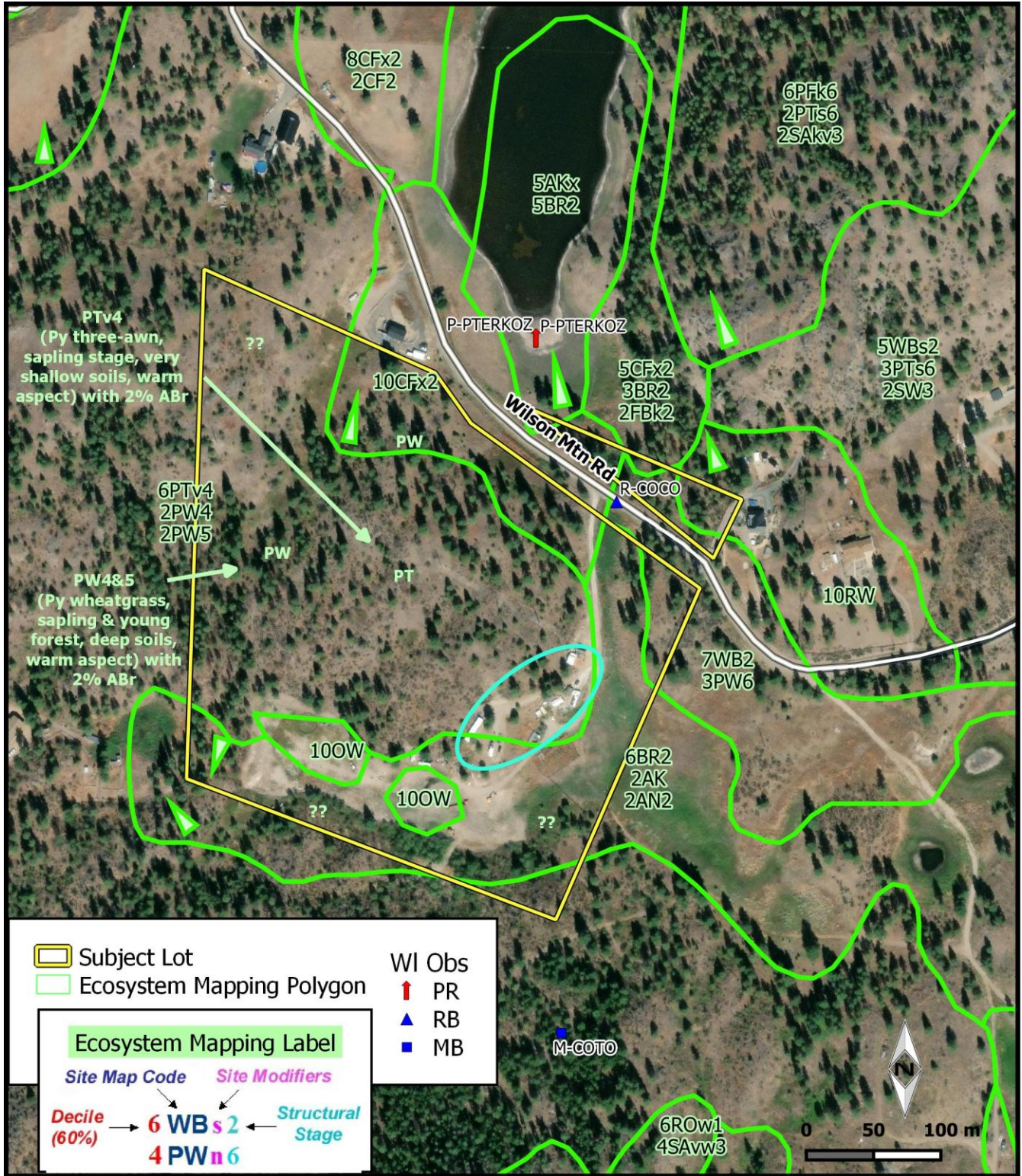


Figure 3: Ecosystem mapping for 380 Wilson Mtn Rd and surrounding area.

The lowlands area of the property, which is most concern due to development interests and recent alterations of habitats (approx 0.69 ha / 1.7 ac), was a Baltic Rush Marsh-Meadow (BR) ecosystem. While these sites are relatively rare, they are often dominated by non-native vegetation and historically have been heavily impacted by livestock. This particular BR ecosystem was likely in a relatively natural state and portions of it remain on the property and to the east. The formation of this ecosystem in this area is a result of the underlying bedrock formations creating basins where subsurface water can accumulate. The morainal soil overburden create a bed over the bedrock but the ever-accumulating organic layer acts as a sponge, retaining water into the drier summer periods and sustaining relatively vibrant vegetation. It appears that ground water accumulates from the catchment area of these basins and from shedding of water from Oliver Mountain. The subsurface movement of water appears to flow in an easterly direction. Aerial photography suggests that this area was more of a meadow area than a marsh (except immediately around the ponds which is accounted for as an Open Water ecosystem), and this is true of the remnants of this ecosystem toward the east within the property and beyond onto the adjacent property. Subsequently it is considered to garner an ESA 2 designation.

However, two deeper depressions within the meadow ecosystem contained open water (OW). The full-pool extent of these features is slightly less than half an acre (0.18 ha) and had depths of approximately four feet according to the client. These small ponds are considered ESA 1 features, despite their small size (Figure 4). The ponds have since been excavated and infilled with coarse fill.



**Figure 4: Ponds (OW) with full-pool boundaries and areas** (image from RDOS website, pre 2018).

A fringe of aspen occurs along the southern boundary of the property where runoff from Oliver Mountain accumulates. Previous fire events has resulted in this being a pole-sapling stand. This ecosystem is considered an ESA 2. Minor disturbance has occurred along the edge of this ecosystem.

ESA designations have been made in the preceding text and have been summarized in Table 2. Rankings are assigned on the condition of the ecosystems prior to 2018 and do not reflect the current condition within the disturbed portion of the property. Most of the ecosystems are designated as either ESA 1 or 2 ranks, which is expected within the PPxh1 biogeoclimatic zone.

**Table 2: ESA designations for ecosystems at 380 Wilson Mtn. Road.**

<b>Ecosystem</b>	<b>ESA Designation</b>	<b>Comments</b>
PT (pine – three awn)	1	Contains extensive antelope brush
PW (pine – wheatgrass)	1	Contains significant antelope brush
BR (Baltic rush meadow)	2	Mostly meadow and not marsh but potential CDC listed plant community
OW (open water)	1	Scarce; critical habitat for amphibians and other wildlife
AK (aspen – Kentucky bluegrass)	2	Mostly young trees and little interior habitat

## Rare and Endangered Species

Many species in BC have assessed for their rarity and threats by the BC Conservation Data Centre (CDC) and they have assigned color-coded ranks to reflect the relative imperilment for their future existence (e.g. Red, Blue, Yellow). The Committee on the Status of Endangered Wildlife in Canada (COSEWIC) also have assessed many species with a national perspective with resulting rankings (endangered, threatened, special concern, not at risk, and data deficient). Part of the purview of Environment and Climate Change Canada (ECCC) is to implement the Species at Risk Act (SARA) and as such, review the findings of COSEWIC and adopt official designations of imperilment but which currently only apply to Federal lands, but ultimately develop recovery plans and geospatially identify critical habitat for each Endangered and Threatened species throughout the Nation. Appendix A provides a compilation of all of the species at risk or of interest that could occur on the subject property and their status as assigned by each of these entities. The most relevant rankings of species in this case are the CDC (provincial) rankings and are hereafter just referred to as SAR.

There have been no previous species inventories done on the subject property or the immediate vicinity so records of Species at Risk (SAR) in this area are scant. The clients appear to unfamiliar with SAR so there were no records of significance obtained from discussions with them. There are three records of interest around the property (see Figure 3). One record is of hibernating Townsend’s Big-eared Bats (Blue-listed) in the mine immediately south of the property. Another is of an American Racer (Blue-listed, Threatened) on Wilson Mtn. Rd near the clients’ driveway and the other is of alkaline wing-nerved moss (Blue, Threatened) which was found beside the large pond just north of the subject property. It is quite possible that this moss also existed around the ponds on the subject property.

Appendix A not only provides a list of potentially occurring species on the subject property but also an assessment of the likelihood of them occurring. The list was initially derived from the CDC for all species



known and associated with the PPxh1 and then species were removed from the list that would never be expected to occur, based on habitat suitability prior to the portion of the property that had been altered (e.g. BR and OW). The following subsections address the potential likelihood of any of these species being present and relying on the habitat for a significant dependence of the habitat for at least part of their life requisites.

The following subsections address the likelihood of species within their taxonomic grouping as having occurred on the subject property.

**Amphibians:** There are two species of amphibians that may have used the two ponds for breeding. The Tiger Salamander (Red; Endangered) uses ponds during the spring for breeding and then the larvae develop within the aquatic environment until they lose their gills and can enter onto dry land, whereupon they typically enter pocket gopher burrows and live within the labyrinth of tunnels that have already created. Spadefoot (Blue; Threatened) have a much more rapid larval development period and when they emerge they burrow in loose soils and remain in aestivation until rains permit them to go out and forage. The two ponds on the subject property likely provided limited breeding opportunities for both species and the surrounding meadows likely provided some terrestrial habitat for developed young and adults.

**Reptiles:** No suitable rock hibernacula features were observed within the subject parcel but it is very likely that a variety of snake species forage on the subject property during the active season. The American Racer (Blue; Threatened) has been observed immediately beside the property and snake dens are known south and north of the property so it is likely that a variety of snake species occur, at least during the active season. The Rubber Boa (Yellow; Special Concern) may be a yearlong resident on the subject property. The Painted Turtle (Blue; Special Concern) is known from wetlands in the general area but the two ponds that existed on the subject property were likely too small to support anything but migrant turtles.

**Birds:** There are two distinct broad habitats on the property, the lowlands and uplands, with little understanding of the ecological importance of the former as it is now altered. There may have been sufficient habitat for some of the shorebirds, listed in Appendix A, but this is speculative. It seems unlikely the two ponds were of adequate size for much waterfowl use. The uplands have been identified as critical habitat for the Lewis's Woodpecker (Blue; Threatened) but the existing trees do not present good nesting habitat due to the diameter of their small trunks.

**Mammals:** There are a large number of bat species that likely forage over the property but it cannot be surmised that the subject property provides critical habitat for any of these species as little roosting habitat occurs. Townsend's Big-eared Bats were known to hibernate in the mine immediately south of the property but there have been no recent confirmations of their continued use of the mine. The Western Harvest Mouse (Blue; Special Concern) likely occurs in the upland areas but is not a household concern like the deer mouse. Critical habitat has been designated for the American Badger but no evidence of occupation was observed.

**Invertebrates:** Insects and other invertebrates are typically poorly studied so their habitat associations are poorly understood. A large number of listed dragonflies and their relatives could have depended on the two small ponds for breeding and the surrounding meadows for foraging. The Behr's Haristreak butterfly (Red; Endangered) is a potential resident in the upland portion of the subject property as it relies on antelope brush for the larvae and a variety of flowering plants during its adult stage. Other very rare invertebrates could occur on the property.

**Plants:** The lack of rare plant inventories on the property make it challenging to assess the potential for their occurrences. The record of the alkaline wing-nerved hair moss (Blue; Threatened), found beside the large pond to the north, and is one species that may have been lost during the infilling and leveling of the two ponds and surrounding areas on the subject property.

## Part 2: Impact Assessment and Mitigation

### Description of Proposed Development

The temporary use permit requests the use of the land that was formerly a meadow and wetland to be used for wet use storage. The initial request involves approximately 0.89 ha (2.2 ac) of land within the ESDPA.

### Assessment of Potential Impacts

The alteration of the meadow area impacted approximately 0.69 ha (1.7 ac) of meadow habitat (ESA 2) and approximately 0.18 ha (0.45 ac) of wetland habitat (ESA 1). Disturbance of the mine road and the area east of the mine road were not considered significant disturbances and so have been excluded from the area calculation (see Figure 5). The following describes the observed and suspected impacts to these ecosystems and species of concern:

#### Baltic rush meadow ecosystem (ESA 2)

Addition of mineral soils and compaction affecting the hydrological capacity of the ground to hold water, destruction of native vegetation, and reduced burrowing opportunities. It is suspected that this results in a loss of terrestrial habitat for the Tiger Salamander (Red, Endangered) and Spadefoot (Blue, Threatened). There also is a suspected degradation of habitat for some birds, snakes, and small mammals.

#### Open water ecosystem (ESA 1)

The infilling of two ponds within the meadow causing a total loss of aquatic habitat for the breeding and rearing of amphibians (e.g. Tiger Salamander, Spadefoot), insects (e.g. dragonflies and allies) and potential loss of alkaline wing-nerved moss (Blue, Threatened) along the shorelines. The two ponds also likely provided limited habitat for waterfowl, shorebirds and a water source for other wildlife (e.g. bats). Note that the habitat value and productivity of these ponds was limited due to their small sizes.



Figure 5: Disturbed area (proposed TUP area) on 380 Wilson Mtn Road looking east (April 2023).

## **Short and Long-term Impacts** (Electoral Area “C” OCP Bylaw 2452, 2008 82 )

Any impacts that could have been considered short-term have already occurred. The impacts to the two ecosystems and their habitat values, as described above, are considered long-term and practical mitigation options are limited (see Mitigation and Compensation section). The following bullets identify some issues that must be addressed:

1. Noxious weed management is likely to become an issue in the future given the extent of disturbed area, regardless of whether the TUP is approved. The **Weed Control Act** requires that landowners control noxious weeds on their property. A list of noxious weeds is provided in Appendix B.
2. If the TUP is approved, fuel management is likely to be an issue , which should be integrated with noxious weed management. Regular mowing will reduce some fuel accumulation but more options need to be explored.
3. If the TUP is approved, wildfire risk must also be considered. A wildfire could not only result in the loss of people’s stored items, but potentially result in the contamination of the site from the release of hydrocarbons and other contaminants into the soil and groundwater. The existing well on the property is poorly suited to respond to an approaching wildfire so there needs to be an approved plan and infrastructure to respond to reducing the risk of wildfire.

## **Cumulative and Residual Impacts**

The greater Fairview/Oliver Mountain area has limited development opportunities with considerable Crown land and most of the private land has zoning and ESDPA designations that should limit future broad-scale alteration of the natural landscape. The approximately 2 acre conversion of this area, providing there is reclamation of the wetlands, should have a nominal cumulative impact. The ongoing maintenance of the property and infrequent public access should not create significant residual impacts. However, it is important that the soils and groundwater are not contaminated by leaking vehicles and equipment within the storage area. There is no clear indication of what type of land use might be appropriate after the wet storage landuse is discontinued. It is anticipated that pocket gophers will slowly work their way into the disturbed area and “fluff” the soil and ultimately naturalize the site, either making it suitable as pasture or a natural area.

## **Avoidance of ESAs**

Alteration of the ESA 1 and 2 have already occurred, totaling approximately 1.01 ha (2.5 ac), although approximately 0.12 ha (0.3 ac) of this disturbed area within the ESDPA includes the previously existing mine road and an areas east of this road that was only lightly disturbed and has since “naturalized”.

## **Mitigation and Compensation**

The greatest impact to the property has been the loss of the two wetlands. The use of fill and resulting soil compaction throughout most of the disturbed area has made any restoration of these specific wetlands impractical. Some of the groundwater supplying these wetlands was from the immediate catchment area, created by the underlying bedrock, but a considerable amount of water seeps down

from Oliver Mountain. A 'ditch pond' has been designed that would be excavated along the southern boundary of the disturbed area to intercept Oliver Mountain seepage and still benefit from the local catchment. The alignment of the ditch pond is presented in Figure 6 and a conceptual cross-section of the ditch pond is presented in Figure 7. Underlying bedrock will undoubtedly influence the actual design of the ditch pond but the full pool area of the ditch pond area would be approximately 0.105 ha (0.26 ac). This is about half of the original extent of the combined area of the original two wetlands but extends across a much longer area (approx. 150 m). The width of the ditch can be expanded in the southwest corner of the disturbed area to increase the full pool area. The low grade slope on the north side would allow for a progressive shallow area for emergent vegetation.



Figure 6: Limits of disturbance within the ESDPA and proposed ditch pond alignment.

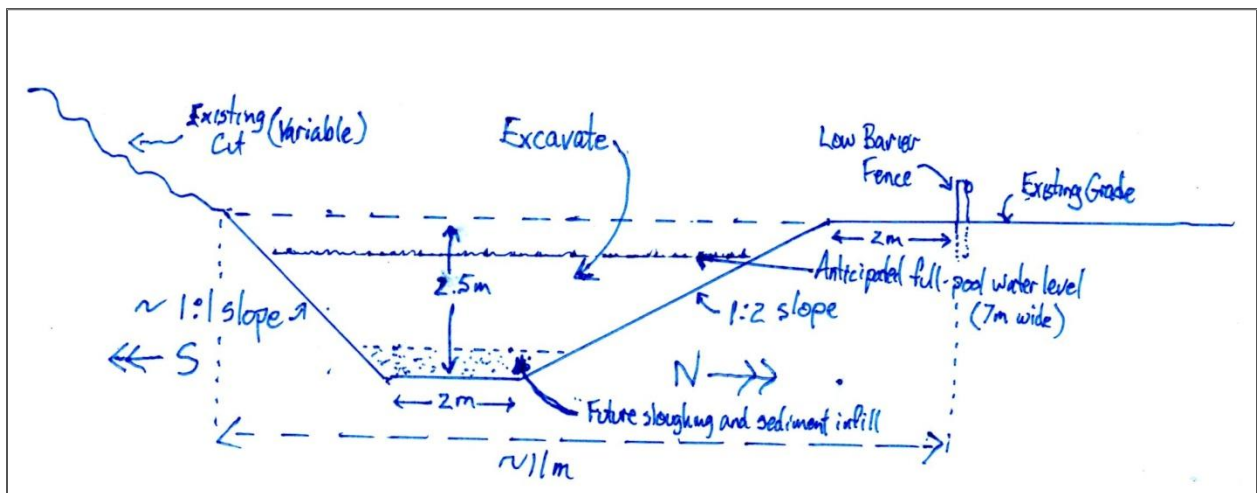


Figure 7: Conceptual scaled drawing of cross section of ditch pond mitigation.

## Security Requirements

Bonds are often required to help ensure that required works are completed. In this situation, the client has equipment that can perform the works as proposed within this assessment. Subsequently, a bond of \$3000.00 will suffice to ensure the work is done by the time specified by the RDOS. The client has an active company based out of Oliver and sincere interests in securing the property so this seems to be an acceptable amount.

## Monitoring Reports

A monitoring report must be filed upon completion of the wetland mitigation works.

## Accountability

It is solely within the RDOS purview to deem past and future accountability, remembering that the clients are not yet the legal owners of the subject property. It is not within the scope of this assessment to assign accountability. The information provided in this report is consistent with the Code of Ethics for Professional Biologists.

## Monitoring Plan

A monitoring plan has not been prepared but must be completed upon the resolution of how to proceed from the RDOS Board review of this application.

## Disclaimer

This assessment has used site visits conducted in April 2023, the advice of two respected professionals (Dwight Shanner and Allison Haney), aerial imagery, and professional interpretation to prepare this assessment. Impacts, both known and suspected are presented, as well as potential mitigation for alterations of the land that have already been executed. Limitations exist for restoration of these lands. It is the responsibility of the RDOS to review this information and formulate the best suited path forward. This assessment in no way attempts to bias the RDOS on matters that concern land use and the application of bylaws and regulations.

Respectfully submitted,



Mike Sarell, RPBio  
Ophiuchus Consulting



17 November 2023

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## Appendix A: BC Species List associated with the PPxh1 that could occur at 380 Wilson Mtn Road (pre-disturbance; adapted from BC CDC 2023)

Refer to the opening paragraph of the Rare and Endangered Species section for information on the ranking system by each jurisdiction. Suitability values have assigned to each species base on the likelihood that a given species would reside in at least one of the available habitats at 380 Wilson Mtn Road, prior to any land alteration activities. The likelihood values are based on the author’s and recorded knowledge of habitat use for each species. Habitat associations are often lacking for some invertebrates and plants, where an unknown value is assigned.

### Amphibians

English Name	Scientific Name	BC List	COSEWIC	SARA	Suitability
Western Tiger Salamander	<i>Ambystoma mavortium</i>	Red	E	1-E (2018)	likely
Great Basin Spadefoot	<i>Spea intermontana</i>	Blue	T	1-T (2003)	likely
Western Toad	<i>Anaxyrus boreas</i>	Yellow	SC	1-SC (2018)	possible

### Reptiles

English Name	Scientific Name	BC List	COSEWIC	SARA	Suitability
North American Racer	<i>Coluber constrictor</i>	Blue	T	1-T (2023)	likely
Western Rattlesnake	<i>Crotalus oreganus</i>	Blue	T	1-T (2005)	likely
Desert Nightsnake	<i>Hypsiglena chlorophaea</i>	Red	E	1-E (2003)	unlikely
Gophersnake, <i>deserticola</i> subspecies	<i>Pituophis catenifer deserticola</i>	Blue	T	1-T (2005)	likely
Northern Rubber Boa	<i>Charina bottae</i>	Yellow	SC	1-SC (2005)	likely
Western Skink	<i>Plestiodon skiltonianus</i>	Blue	SC	1-SC (2005)	unlikely
Pygmy Short-horned Lizard	<i>Phrynosoma douglasii</i>	Red	XT	1-XT (2003)	unlikely
Painted Turtle - Intermountain - Rocky Mtn pop	<i>Chrysemys picta</i> pop. 2	Blue	SC	1-SC (2007)	possible



## Birds

English Name	Scientific Name	BC List	COSEWIC	SARA	Suitability
Great Blue Heron, <i>herodias</i> subsp	<i>Ardea herodias herodias</i>	Blue			possible
Green Heron	<i>Butorides virescens</i>	Blue			possible
Black-crowned Night-Heron	<i>Nycticorax nycticorax</i>	Red			possible
American Bittern	<i>Botaurus lentiginosus</i>	Blue			possible
American Avocet	<i>Recurvirostra americana</i>	Blue			unlikely
Red-necked Phalarope	<i>Phalaropus lobatus</i>	Blue	SC	1-SC (2019)	unlikely
Short-billed Dowitcher	<i>Limnodromus griseus</i>	Red			unlikely
Long-billed Curlew	<i>Numenius americanus</i>	Yellow	SC	1-SC (2005)	unlikely
Hudsonian Godwit	<i>Limosa haemastica</i>	Red	T		unlikely
Clark's Grebe	<i>Aechmophorus clarkii</i>	Red			unlikely
Western Grebe	<i>Aechmophorus occidentalis</i>	Red	SC	1-SC (2017)	unlikely
Eared Grebe	<i>Podiceps nigricollis</i>	Blue			unlikely
American Golden-Plover	<i>Pluvialis dominica</i>	Blue			unlikely
Canyon Wren	<i>Catherpes mexicanus</i>	Blue	NAR		possible
Barn Swallow	<i>Hirundo rustica</i>	Yellow	SC	1-T (2017)	possible
Lark Sparrow	<i>Chondestes grammacus</i>	Blue			unlikely
Grasshopper Sparrow	<i>Ammodramus savannarum</i>	Red			unlikely
Horned Lark, <i>merrilli</i> subspecies	<i>Eremophila alpestris merrilli</i>	Red			unlikely
Common Nighthawk	<i>Chordeiles minor</i>	Blue	SC	1-SC (2023)	likely
Gray Flycatcher	<i>Empidonax wrightii</i>	Blue	NAR		possible
Olive-sided Flycatcher	<i>Contopus cooperi</i>	Yellow	SC	1-SC (2023)	possible
Evening Grosbeak	<i>Coccothraustes vespertinus</i>	Yellow	SC	1-SC (2019)	possible
Rusty Blackbird	<i>Euphagus carolinus</i>	Blue	SC	1-SC (2009)	possible
Band-tailed Pigeon	<i>Patagioenas fasciata</i>	Blue	SC	1-SC (2011)	possible
Yellow-billed Cuckoo	<i>Coccyzus americanus</i>	Red			possible
Lewis's Woodpecker	<i>Melanerpes lewis</i>	Blue	T	1-T (2012)	likely
White-headed Woodpecker	<i>Dryobates albolarvatus</i>	Red	E	1-E (2003)	unlikely
Short-eared Owl	<i>Asio flammeus</i>	Blue	T	1-SC (2012)	unlikely
Western Screech-Owl, <i>macfarlanei</i> subsp	<i>Megascops kennicottii macfarlanei</i>	Blue	T	1-T (2005)	unlikely
Flammulated Owl	<i>Psiloscopus flammeolus</i>	Blue	SC	1-SC (2003)	unlikely

## Mammals

English Name	Scientific Name	BC List	COSEWIC	SARA	Suitability
Pallid Bat	<i>Antrozous pallidus</i>	Red	T	1-T (2003)	likely
Hoary Bat	<i>Lasiurus cinereus</i>	Blue	E		likely
Spotted Bat	<i>Euderma maculatum</i>	Blue	SC	1-SC (2005)	likely
Townsend's Big-eared Bat	<i>Corynorhinus townsendii</i>	Blue			likely
Silver-haired Bat	<i>Lasionycteris noctivagans</i>	Yellow			likely
Big Brown Bat	<i>Eptesicus fuscus</i>	Yellow			likely
Californian Myotis	<i>Myotis californicus</i>	Yellow			possible
Long-eared Myotis	<i>Myotis evotis</i>	Yellow			likely
Long-legged Myotis	<i>Myotis volans</i>	Yellow			possible
Western Small-footed Myotis	<i>Myotis ciliolabrum</i>	Blue			likely
Little Brown Myotis	<i>Myotis lucifugus</i>	Blue	E	1-E (2014)	possible
Fringed Myotis	<i>Myotis thysanodes</i>	Blue	DD	3 (2005)	likely
Yuma Myotis	<i>Myotis yumanensis</i>	Blue			likely
Columbia Plateau Pocket Mouse	<i>Perognathus parvus</i>	Blue			possible
Northern Bog Lemming, <i>artemisiae</i> subsp	<i>Synaptomys borealis artemisiae</i>	Blue			unknown
Western Harvest Mouse	<i>Reithrodontomys megalotis</i>	Blue	E	1-SC (2009)	likely
Nuttall's Cottontail	<i>Sylvilagus nuttallii</i>	Blue	SC	1-SC (2007)	likely
Merriam's Shrew	<i>Sorex merriami</i>	Red			unknown
Preble's Shrew	<i>Sorex preblei</i>	Red			unknown
American Badger	<i>Taxidea taxus</i>	Red	E	1-E (2018)	possible

## Invertebrates

English Name	Scientific Name	BC List	COSEWIC	SARA	Suitability
Pale Jumping-slug	<i>Hemphillia camelus</i>	Blue			unlikely
Dusky Fossaria	<i>Galba dalli</i>	Blue			unknown
Golden Fossaria	<i>Galba obrussa</i>	Blue			unknown
Attenuate Fossaria	<i>Galba truncatula</i>	Blue			unknown
Magnum Mantleslug	<i>Magnipelta mycophaga</i>	Blue	SC	1-SC	unknown
Umbilicate Sprite	<i>Promenetus umbilicatellus</i>	Blue			unknown
Abbreviate Pondsnaill	<i>Stagnicola apicina</i>	Blue			unknown
Widelip Pondsnaill	<i>Stagnicola traski</i>	Blue			unknown
Herrington Fingernailclam	<i>Sphaerium occidentale</i>	Blue			unknown
Striated Fingernailclam	<i>Sphaerium striatinum</i>	Blue			unknown
Lance-tipped Darner	<i>Aeshna constricta</i>	Blue			possible
Twelve-spotted Skimmer	<i>Libellula pulchella</i>	Blue			possible
Sinuuous Snaketail	<i>Ophiogomphus occidentis</i>	Blue			possible
Pronghorn Clubtail	<i>Phanogomphus graslinellus</i>	Blue			possible
Olive Clubtail	<i>Stylurus olivaceus</i>	Blue	E	1-E (2017)	possible
Western Pondhawk	<i>Erythemis collocata</i>	Yellow			possible
Alkali Bluet	<i>Enallagma clausum</i>	Blue			possible
Emma's Dancer	<i>Argia emma</i>	Blue			possible
Vivid Dancer	<i>Argia vivida</i>	Blue	SC	1-SC (2019)	possible
Sandhill Skipper	<i>Polites sabuleti</i>	Red			possible
Nevada Skipper	<i>Hesperia nevada</i>	Blue			possible
Checkered Skipper	<i>Pyrgus communis</i>	Blue			possible
Sonora Skipper	<i>Polites sonora</i>	Blue	NAR		possible
Lilac-bordered Copper	<i>Lycaena nivalis</i>	Blue			possible
Common Sootywing	<i>Pholisora catullus</i>	Blue			possible
Mormon Fritillary, <i>erinna</i> subsp	<i>Speyeria mormonia erinna</i>	Red			possible
California Hairstreak	<i>Satyrium californica</i>	Blue			possible
Immaculate Green Hairstreak	<i>Callophrys affinis</i>	Blue			possible
Behr's Hairstreak	<i>Satyrium behrii</i>	Red	E	1-E (2003)	likely
Half-moon Hairstreak	<i>Satyrium semiluna</i>	Red	E	1-E (2007)	unlikely
Monarch	<i>Danaus plexippus</i>	Red	E	1-SC (2003)	possible
Viceroy	<i>Limenitis archippus</i>	Red			possible
Mormon Metalmark	<i>Apodemia mormo</i>	Red	E	1-E (2005)	unlikely
Columbia Dune Moth	<i>Copablepharon absidum</i>	Red	DD		possible
Nuttall's Sheepmoth	<i>Hemileuca nuttalli</i>	Red	E	1-E (2023)	possible
Western Bumble Bee	<i>Bombus occidentalis</i>	Yellow	T		possible
Okanagan Hammertail	<i>Efferia okanaganana</i>	Red	E	1-E (2017)	possible
Hairy-necked Tiger Beetle	<i>Cicindela hirticollis</i>	Blue			possible
Badlands Tiger Beetle	<i>Cicindela decemnotata</i>	Red			possible
Dark Saltflat Tiger Beetle	<i>Cicindela parowana</i>	Red	E	1-E (2012)	possible
wind scorpion	<i>Eremobates scaber</i>	Red			possible

## Plants

English Name	Scientific Name	BC List	COSEWIC	SARA	Suitability
abrading ring	<i>Arctoparmelia subcentrifuga</i>	Blue			unknown
cut-leaved water-parsnip	<i>Berula incisa</i>	Blue			unknown
Cascade rockcress	<i>Boechera cascadenis</i>	Blue			unknown
river bulrush	<i>Bolboschoenus fluviatilis</i>	Blue			unknown
Columbian carpet moss	<i>Bryoerythrophyllum columbianum</i>	Blue	SC	1-SC (2005)	unknown
Cusick's paintbrush	<i>Castilleja cusickii</i>	Blue			unknown
heart-leaved springbeauty	<i>Claytonia cordifolia</i>	Blue			unknown
slender hawksbeard	<i>Crepis atribarba</i> ssp. <i>atribarba</i>	Blue			unknown
western hawksbeard	<i>Crepis occidentalis</i> ssp. <i>conjuncta</i>	Blue			unknown
tiny tassel	<i>Crossidium seriatum</i>	Blue	SC	1-SC (2019)	unknown
Watson's cryptantha	<i>Cryptantha watsonii</i>	Blue			unknown
quilted stippleback	<i>Dermatocarpon intestiniforme</i>	Blue			unknown
Englemann's spike-rush	<i>Eleocharis engelmannii</i>	Blue			unknown
rusty cord-moss	<i>Entosthodon rubiginosus</i>	Blue	SC	1-E (2021)	unknown
cushion daisy	<i>Erigeron poliospermus</i> var. <i>poliospermus</i>	Blue			unknown
Thurber's needlegrass	<i>Eriocoma thurberiana</i>	Blue			unknown
Suksdorf's monkey-flower	<i>Erythranthe suksdorfii</i>	Blue			unknown
Washington fescue	<i>Festuca washingtonica</i>	Blue			unknown
desert sulphur	<i>Fulgensia desertorum</i>	Blue			unknown
hairstem groundsmoke	<i>Gayophytum ramosissimum</i>	Blue			unknown
slender gilia	<i>Lathrocasis tenerrima</i>	Blue			unknown
black rocklicorice	<i>Lichinella nigritella</i>	Blue			unknown
sulphur lupine	<i>Lupinus sulphureus</i>	Blue			unknown
hairy water-clover	<i>Marsilea vestita</i>	Blue			unknown
chopped liver	<i>Massalongia microphylliza</i>	Blue			unknown
blistered toad	<i>Neofuscelia loxodes</i>	Blue			unknown
erupting toad	<i>Neofuscelia subhosseana</i>	Blue			unknown
exuberant rosette	<i>Physcia dimidiata</i>	Blue			unknown
alkaline wing-nerved moss	<i>Pterygoneurum kozlovii</i>	Blue	T	1-T (2006)	likely
peach-leaf willow	<i>Salix amygdaloides</i>	Blue			unknown
Whited's fissurewort	<i>Sandbergia whitedii</i>	Blue			unknown
hairgrass dropseed	<i>Sporobolus airoides</i>	Blue			unknown
scarlet ammannia	<i>Ammannia robusta</i>	Red	E	1-E (2003)	unknown
The Dalles milk-vetch	<i>Astragalus sclerocarpus</i>	Red			unknown
Spalding's milk-vetch	<i>Astragalus spaldingii</i>	Red			unknown
annual paintbrush	<i>Castilleja minor</i> var. <i>exilis</i>	Red			unknown
small-flowered lipocarpha	<i>Cyperus subsquarrosus</i>	Red	E	1-E (2005)	unlikely

bent spike-rush	<i>Eleocharis geniculata</i>	Red	E	1-E (2011)	unknown
parsnip-flowered buckwheat	<i>Eriogonum heracleoides</i> var. <i>leucophaeum</i>	Red			unknown
shy gilia	<i>Gilia sinuata</i>	Red			unknown
Harkness' linanthus	<i>Leptosiphon harknessii</i>	Red			unknown
nugget moss	<i>Microbryum vlassovii</i>	Red	E	1-E (2009)	unknown
Andean evening-primrose	<i>Neoholmgrenia andina</i>	Red			unknown
pale evening-primrose	<i>Oenothera pallida</i> ssp. <i>pallida</i>	Red			unknown
Grand Coulee owl-clover	<i>Orthocarpus barbatus</i>	Red	E	1-E (2006)	unlikely
powder-lined rock-olive	<i>Peltula euploca</i>	Red			unknown
branched phacelia	<i>Phacelia ramosissima</i> var. <i>ramosissima</i>	Red	E	1-E (2006)	unlikely
showy phlox	<i>Phlox speciosa</i> ssp. <i>occidentalis</i>	Red	T	1-T (2006)	unlikely
toothcup	<i>Rotala ramosior</i>	Red	E	1-E (2003)	unknown
Rocky Mountain clubrush	<i>Schoenoplectiella saximontana</i>	Red			unknown
collapsing vinyl	<i>Scytinium schraderi</i>	Red			unknown
Idaho blue-eyed grass	<i>Sisyrinchium idahoense</i> var. <i>occidentale</i>	Red			unknown
Ute lady's tresses	<i>Spiranthes diluvialis</i>	Red	E		unknown
short-rayed aster	<i>Symphyotrichum frondosum</i>	Red	E	1-E (2007)	unknown
short-flowered evening-primrose	<i>Taraxia breviflora</i>	Red			unknown
western centaury	<i>Zeltnera exaltata</i>	Red			unknown
dark lamb's-quarters	<i>Chenopodium atrovirens</i>	Unknown			unknown
wild tobacco	<i>Nicotiana attenuata</i>	Unknown			unknown
winged combseed	<i>Pectocarya penicillata</i>	Unknown			unknown
diverse-leaved cinquefoil	<i>Potentilla glaucophylla</i> var. <i>perdissecta</i>	Yellow			unknown

## Appendix B: Noxious Weeds

Noxious weeds are presented as two tables. The first table includes all provincially listed noxious weeds, some of which are unlikely to thrive in the South Okanagan. The second table includes regional noxious weeds and some additional weeds which have the potential to become established in the South Okanagan. Those weeds that are likely to be encountered on the property are highlighted.

### Provincially listed Noxious Weeds

Common Name	Scientific Name	Common Name	Scientific Name
Annual Sow Thistle	<i>(Sonchus oleraceus)</i>	Perennial Sow Thistle	<i>(Sonchus arvensis)</i>
Bohemian Knotweed	<i>(Fallopia x bohemica)</i>	Purple Loosestrife	<i>(Lythrum salicaria)</i>
Bur Chervil	<i>(Anthriscus caucalis)</i>	Purple Nutsedge	<i>(Cyperus rotundus)</i>
Canada Thistle	<i>(Cirsium arvense)</i>	Rush Skeletonweed	<i>(Chondrilla juncea)</i>
Common Crupina	<i>(Crupina vulgaris)</i>	Saltmeadow Cordgrass	<i>(Spartina patens)</i>
Common Reed	<i>(Phragmites australis subspecies australis)</i>	Scentless Chamomile	<i>(Matricaria maritima)</i>
Common Toadflax	<i>(Linaria vulgaris)</i>	Smooth Cordgrass	<i>(Spartina alterniflora)</i>
Dalmatian Toadflax	<i>(Linaria dalmatica)</i>	Spotted Knapweed	<i>(Centaurea maculosa)</i>
Dense-flowered Cordgrass	<i>(Spartina densiflora)</i>	Tansy Ragwort	<i>(Senecio jacobaea)</i>
Diffuse Knapweed	<i>(Centaurea diffusa)</i>	Velvetleaf	<i>(Abutilon theophrasti)</i>
Dodder	<i>(Cuscuta spp.)</i>	Wild Oats	<i>(Avena fatua)</i>
English Cordgrass	<i>(Spartina anglica)</i>	Yellow Flag Iris	<i>(Iris pseudacorus)</i>
Flowering Rush	<i>(Butomus umbellatus)</i>	Yellow Nutsedge	<i>(Cyperus esculentus)</i>
Garlic Mustard	<i>(Alliaria petiolata)</i>	Yellow Starthistle	<i>(Centaurea solstitialis)</i>
Giant Hogweed	<i>(Heracleum mantegazzianum)</i>		
Giant Knotweed	<i>(Fallopia sachalinensis)</i>		
Giant Mannagrass/Reed Sweetgrass	<i>(Glyceria maxima)</i>		
Gorse	<i>(Ulex europaeus)</i>		
Himalayan Knotweed	<i>(Polygonum polystachyum)</i>		
Hound's-tongue	<i>(Cynoglossum officinale)</i>		
Japanese Knotweed	<i>(Fallopia japonica)</i>		
Jointed Goatgrass	<i>(Aegilops cylindrica)</i>		
Leafy Spurge	<i>(Euphorbia esula)</i>		
Milk Thistle	<i>(Silybum marianum)</i>		
North Africa Grass	<i>(Ventenata dubia)</i>		

## Regionally listed Noxious Weeds and others

Common Name	Scientific Name
Blueweed	<i>(Echium vulgare)</i>
Burdock	<i>(Arctium spp.)</i>
Common Bugloss	<i>(Anchusa officinalis)</i>
Common Tansy	<i>(Tanacetum vulgare)</i>
Hoary Alyssum	<i>(Berteroa incana)</i>
Hoary Cress	<i>(Cardaria spp.)</i>
Orange Hawkweed	<i>(Hieracium aurantiacum)</i>
Puncturevine	<i>(Tribulus terrestris)</i>
Longspine Sandbur	<i>(Cenchrus longispinus)</i>
Russian Knapweed	<i>(Acroptilon repens)</i>
Sulphur Cinquefoil	<i>(Potentilla recta)</i>