Results of a Foreshore Inventory for At Risk Plant Species in the South Okanagan Valley, BC

Red-rooted cyperus alongside oxbow, north end of Osoyoos Lake, October 2, 2013.

January 10, 2014

Prepared by:
Terry T. McIntosh
3-1175 E. 14th Ave.
Vancouver, BC, V5T 2P2
604-874-1175
778-968-4101 (C)
ttmcintosh@shaw.ca

Prepared for:
Josie Symonds
Ministry of Forests, Lands and Natural Resource Operations
102 Industrial Pl.
Penticton, BC, V2A 7C8
josie.symonds@gov.bc.ca

Table of Contents

List of Tables

List of Figures

Summary

This report summarizes and discusses the results of at risk plant surveys that were completed in foreshore and associated riparian habitats along Osoyoos Lake and Vaseux Lake in the south Okanagan Valley in October, 2013. Portions of these lakes have been previously surveyed and at risk plants had been reported. During the 2013 surveys, seven at risk plants, including six vascular plants and one moss, were observed. Most of these species were reported only from the Osoyoos Lake survey areas. Two at risk animals were also observed, Rocky Mountain Ridged Mussel and shells of Painted Turtle. Threats that were observed to the habitats of at risk plant species included invasive exotic plants, in particular reed canarygrass and yellow iris, shoreline maintenance, livestock, and lake wave action. These threats have both altered habitats, probably permanently at some sites, and decreased the range of at risk plant species in the study areas. Numerous habitats of high potential for at risk plants were observed along the northern shores of Osoyoos Lake. In contrast, few sites contained suitable habitat for at risk species along Vaseux Lake. Recommendations for future work include re-surveying some of the 2013 sites, surveying new sites, developing site- and species-specific monitoring protocols, and considering transplanting at risk species to some high potential habitats.

Acknowledgements

Many thanks to Josie Symonds (MFLNRO Ecosystems), Jamie Leathem (UBC), and Mark Weston (BC Parks) for field assistance. Thanks also to Josie for helping to prepare maps and for most of the photography. Lastly, thanks to Kirk Safford and Don Gayton for reviewing the manuscript.

Contractor Qualifications

Dr. Terry McIntosh has been completing botanical surveys in the south Okanagan Valley for over 30 years. Much of his focus over the past seven years has been within drawdown riparian habitats, especially alongside Osoyoos Lake, but also along the Thompson River system. He completed many riparian-related projects with the Osoyoos Indian Band and the BC Government. He is presently an associate with the Herbarium in the Biodiversity Museum at UBC in Vancouver. He is an editor and board member for the Flora of North America project, and has written treatments for eleven moss genera as well as one family treatment (Mniaceae).

1 Introduction

This report summarizes and discusses the results of at risk plant surveys that were completed in foreshore and associated riparian habitats along Osoyoos Lake and Vaseux Lake in the south Okanagan Valley from October 2-4, 2013.

Portions of both Osoyoos Lake and Vaseux Lake have been previously surveyed and at risk plants have been reported. McIntosh (2007) reported eleven at risk plants in the Willow Beach area at the north end of Osoyoos Lake (Table 1; listed in an environmental impact statement for a proposed development by Pottinger Gaherty Environmental Consultants Ltd. 2008). These species were observed either on private property or to the east in the South Okanagan Wildlife Management Area (SOWMA). At the time, all of these records represented new locations for these species in British Columbia. Seven of the species are Red Listed (Endangered or Threatened) and four are Blue Listed (Special Concern) provincially by the British Columbia Conservation Data Center (CDC 2013). Two species, small-flowered lipocarpha and short-rayed aster, are considered federally endangered in the Species at Risk Act (SARA).

Table 1. At risk plant species found in the Willow Beach area in 2007 (from Pottinger Gaherty Environmental Consultants Ltd. 2008).

Species	Status (Provincial: Federal)	Habitat Use
Berula erecta (cut-leaved water-parsnip)	Red: n/a	Found one plant along beach north end of lake.
Carex hystricina (porcupine sedge)	Blue: n/a	2–3 plants in sand along beach north end of lake.
Carex sychnocephala (many-headed sedge)	Blue: n/a	1 plant in trampled area.
Chamaesyce serpyllifolia (thyme-leaved spurge)	Blue: n/a	5 plants in sand along beach north end of lake.
Cyperus erythrorhizos (red-rooted cyperus)	Red: n/a	10 plants at 3 locations in sand and mud along oxbow shorelines.
Cyperus squarrosus (awned cyperus)	Blue: n/a	Hundreds of plants in sand along beach north squarrosus end of lake east of main footprint; a few plants along edge of oxbow.
Eleocharis engelmannii (Engelmann's spike-rush)	Red: n/a	1 plant on mud knoll; site heavily utilized by horses and possibly cattle.
Eleocharis (possibly *E. geniculata*) (bent spike-rush)	Red: n/a	2 plants on mud knoll; site heavily utilized by horses and possibly cattle. One plant was destroyed by horse trampling during field work.

Species	Status (Provincial: Federal)	Habitat Use
Lipocarpha micrantha (small-flowered lipocarpha)	Red: Endangered	3 plants in sand along beach just south of house.
Symphyotrichum frondosum (short-rayed aster)	Red: Endangered	1 plant in sand along disturbed beach in small inlet where boats are kept
Verbena hastata var. *scabra* (blue vervain)	Red: n/a	A few plants (~8) across wetter sites along the oxbows. Most sites heavily disturbed by domestic animals (including pigs).

During an Osoyoos Lake foreshore survey for at risk plants in 2009, portions of the Willow Beach area as well as portions of SOWMA were re-surveyed (McIntosh 2010). During this survey, only thyme-leaved spurge and awned cyperus were observed but had much lower numbers of plants than in 2007. Two species, small-flowered lipocarpha and short-rayed aster, were not observed and were considered extirpated because of changes to the foreshore habitat. Non-native invasive plants had almost completely covered the previously open beach where small-flowered lipocarpha was observed in 2007, and the portion of the foreshore where short-rayed aster was observed had been washed away by waves (possibly as a result of the unusually high water levels the previous year).

Although some portions of the eastern Vaseux Lake shoreline had been surveyed over time and at risk plants had been observed, most importantly short-rayed aster, many shorelines had not been investigated.

The main objectives of the survey of foreshore and associated riparian habitats along north end of Osoyoos Lake and portions of Vaseux Lake were:

1. to document new records and confirm status of existing records of at risk plant species.
2. to document and describe all areas with high potential habitat for foreshore at risk plants.
3. to provide location coordinates for all at risk plants found and provide a completed CDC Plant Observation Form (in Excel format) for each new and updated at risk plant species record.
4. to provide a report (containing species recorded, search effort, threats observed, habitat assessment, and recommendations for at risk plant management).

2 Methods

2.1 Project Preparation

Lists of known and potential at risk plants for riparian and other wetland habitats in the south Okanagan Valley were reviewed, mainly based on records from the provincial Conservation Data Center (CDC) but also from the surveyor's experience in the region. The list of focal at risk plants provided by the client in the Service Agreement was also reviewed (Table 2).

Table 2. Target Species for Foreshore At Risk Plant Inventory from the Service Agreement (habitat column added).

Scientific Name	Common Name	BC CDC Status	Habitat
Ammannia robusta	scarlet ammannia	Red	muddy-sandy inshore depressions
Bidens vulgata	tall beggarticks	Red	shorelines and inshore wetlands
Berula erecta	cut-leaved water-parsnip	Blue	inshore wetlands and shorelines
Carex comosa	bearded sedge	Red	shorelines and wet meadows
Carex hystericina	porcupine sedge	Blue	shorelines and wet meadows
Carex sychnocephala	many-headed sedge	Blue	shorelines and wet meadows
Carex vulpinoidea	fox sedge	Blue	shorelines and wet meadows
Chamaesyce serpyllifolia ssp. *serpyllifolia*	thyme-leaved spurge	Blue	sandy shorelines
Cyperus squarrosus	awned cyperus	Blue	sandy shorelines
Cyperus erythrorhizos	red-rooted cyperus	Red	muddy and sandy shorelines
Eleocharis coloradoensis	dwarf spike-rush	Red	shorelines and inshore depressions
Eleocharis geniculata	bent spike-rush	Red	inshore depressions
Eleocharis ovata	ovate spike-rush	Red	inshore depressions
Limosella acaulis	Owyhee mudwort	Red	muddy-sandy inshore depressions
Lindernia dubia var. *anagallidea*	false-pimpernel	Blue	muddy-sandy inshore depressions
Lipocarpha micrantha	small-flowered lipocarpha	Red	shorelines and inshore depressions
Potentilla paradoxa	bushy cinquefoil	Red	shorelines and inshore depressions
Rotala ramosior	toothcup meadow-foam	Red	inshore depressions
Salix amygdaloides	peach-leaf willow	Red	shorelines and inshore depressions
Symphyotrichum frondosum	short-rayed aster	Red	shorelines and inshore depressions

2.2 Field Work

Field work was completed by T. McIntosh, Josie Symonds (MFLNRO Ecosystems), Jamie Leathem (UBC), and Mark Weston (BC Parks) on October 2, 3, and 4, 2013.

The main inventory focus along Osoyoos Lake was within naturally vegetated foreshore habitats and oxbows between the private property at Willow Beach and the Osoyoos Indian Band reserve, which included portions of the South Okanagan Wildlife Management Area (SOWMA) and Haynes Lease Ecological Reserve. Along Vaseux Lake, the focus was within foreshore and associated habitat along the lake perimeter, including Franmar Lease, Sub-lot 15 Lease, Salter Lease, Vaseux Lake North End Designated Use Area, Vaseux Lake Provincial Park, and natural foreshore habitat fronting private lands. Inventory was also completed in some of the oxbows at the north end of lake and along the lagoons at the south end of the lake. Figures 1 – 4 show the survey tracks for the majority of the 2013 field work (figures prepared by J. Symonds).

Surveying was completed mainly by canoe. However, shorelines alongside Vaseux Lake Provincial Park and Christie Memorial Park (south end of Skaha lake; not shown on figures), as well as a seasonally wet area north of Osoyoos Lake (Fig. 4), were accessed by foot. An intuitive survey method was employed during the work (e.g., U.S. Department of the Interior 2009). With this type of survey, areas with the highest potential for at risk plant species are inventoried more closely than habitats that lack or are unlikely to have at risk species present. Representative photographs were taken, mainly by J. Symonds but also T. McIntosh and M. Weston, of at risk plants, plant communities, and/or habitats, and of other significant features (e.g., invasive exotic plants). Waypoints and tracking of the survey using a Garmin GPSmap60Cx unit were undertaken by M. Weston.

Excel files and a set of photographs have been sent to the client along with this report. Limited collections were made during the surveys and they will be deposited into the Herbarium at the Beatty Museum at UBC, Vancouver.

Figure 1. Survey track in the north Osoyoos Lake area on October 2, 2013.

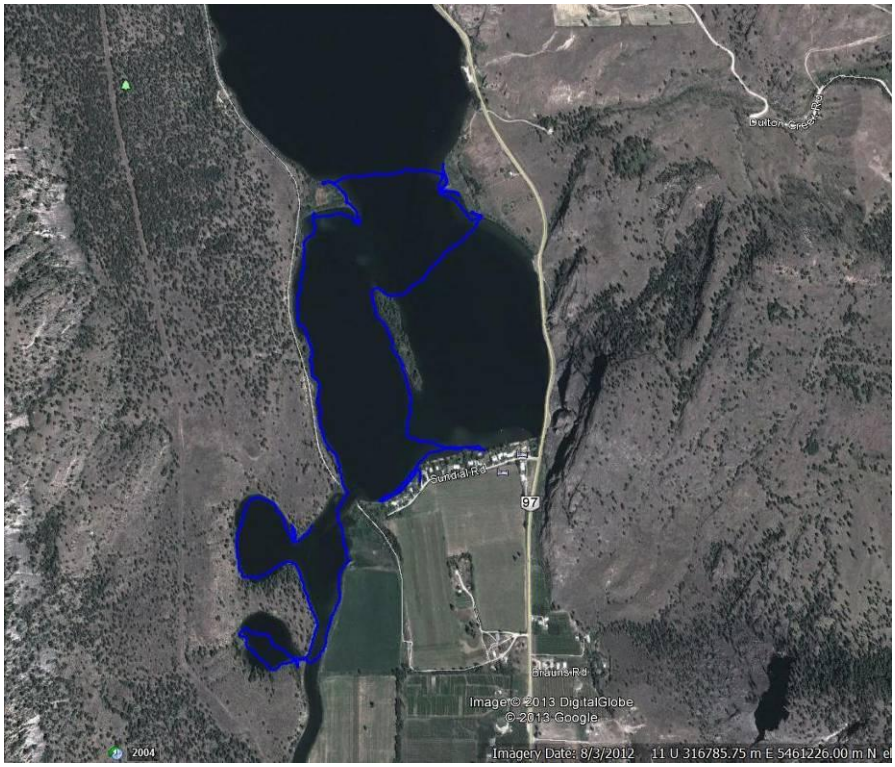

Figure 2. Survey track in the south Vaseux Lake area on October 3, 2013.

Figure 3. Survey track in the north Vaseux Lake area on October 4, 2013.

Figure 4. Survey track in the north Osoyoos Lake area on October 4, 2013.

3 Results

3.1 At Risk Plant Species

Seven at risk plants, including six vascular plants and one moss, were observed during the 2013 surveys (Table 3; Figs. 5 - 17). One graminoid vascular plant, tentatively identified as river bulrush, was observed at eight sites. Most of these species, except for short-rayed aster and the putative river bulrush, were reported only from the Osoyoos Lake survey areas. Collections were made of four of these species for identity confirmation (Table 3). Curtis Björk[1] confirmed the peach-leaf willow collection.

Table 3. At risk plant species observed during surveys along Osoyoos Lake, Vaseux Lake, and Skaha Lake (Christie Memorial Park) in 2013.

Scientific Name (* = collection made)	**Common Name**	**Conservation Status** (CDC / SARA)	**Details** OL = Osoyoos Lake, VL = Vaseux Lake, CM = Christie Memorial Park
Vascular Plants			
Chamaesyce serpyllifolia ssp. *serpyllifolia*	thyme-leaved spurge (Figs. 5 and 6)	Blue	1 site (OL); on sandy beach
Cyperus squarrosus	awned cyperus (Figs. 7 - 9)	Blue	5 sites (OL); on sandy beach
*Cyperus erythrorhizos**	red-rooted cyperus (Figs. 10 - 11)	Red	1 site (OL); on muddy soil along oxbow
Lipocarpha micrantha	small-flowered lipocarpha (Figs. 12 - 13)	Red / Endangered	1 site (OL); on sandy beach
*Salix amygdaloides**	peach-leaf willow	Red	1 site (OL); in riparian edge along beach
Symphyotrichum frondosum	short-rayed aster (Figs. 14 - 15)	Red / Endangered	2 sites (VL, CM); along stony or sandy shoreline
Unconfirmed			
Bolboschoenus ? *fluviatilis**	river bulrush (Fig. 16)	Red	8 sites (6 at OL and 2 at VL); along shorelines and inshore pockets
Bryophytes (Moss)			
*Physcomitrella patens**	Fig. 17	Red	1 site (OL); on muddy soil along oxbow

[1] Curtis Björk is a well known BC botanist presently developing an updated Flora of British Columbia along with Jamie Fenneman, UBC, Vancouver.

Figure 5. Large patch of thyme-leaved spurge on sand (WP229; J. Symonds).

Figure 6. Close-up of thyme-leaved spurge showing characteristic apically toothed leaves (WP229; J. Symonds).

Figure 7. Awned cyperus growing in dune swale (WP228; J. Symonds).

Figure 8. Large awned cyperus plants (WP228; J. Symonds).

Figure 9. Close-up of awned cyperus flower heads showing recurved awns (WP219; J. Symonds).

Figure 10. Habitat for red-rooted cyperus (WP230; J. Symonds).

Figure 11. Red-rooted cyperus plants (WP230; J. Symonds).

Figure 12. Small-flowered lipocarpha plant (WP228; J. Symonds).

Figure 13. Close-up showing ovoid flower spikes of small-flowered lipocarpha (WP228; J. Symonds).

Figure 14. Habitat of short-rayed aster along north-west shore of Vaseux Lake (near WP279; J. Symonds).

Figure 15. Small short-rayed aster plant (WP281; J. Symonds).

Figure 16. Patch of possible river bulrush along north shore of Osoyoos Lake (WP214; J. Symonds).

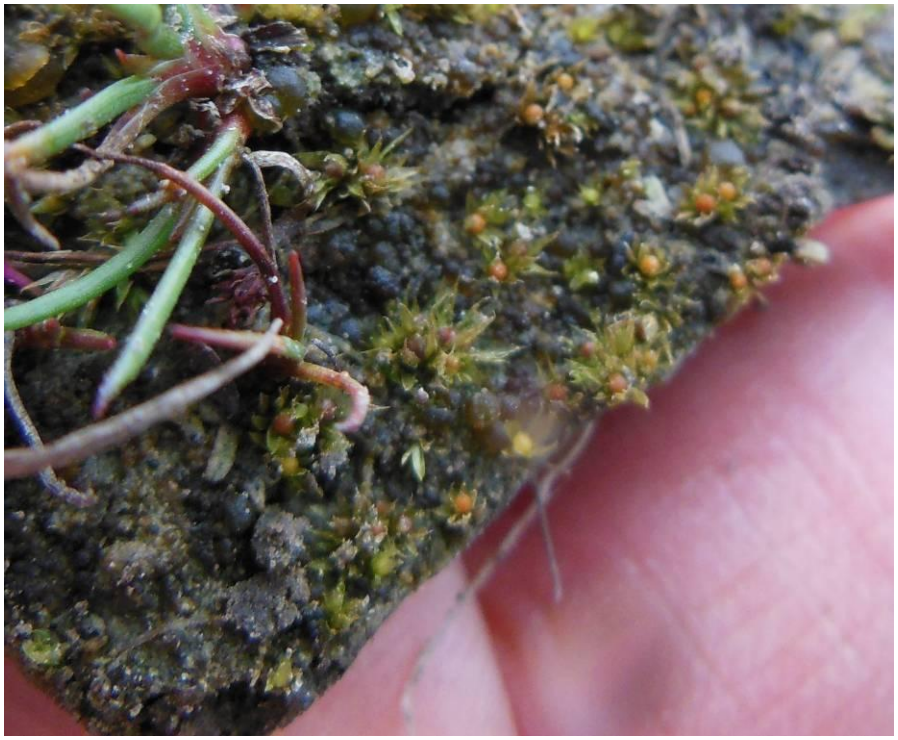

Figure 17. Patch of *Physcomitrella patens* showing small sporophytes immersed in leaves (WP214; J. Symonds).

A number of collections or photographs of possible at risk taxa were taken of plants that could not be identified in the field. A species of *Potentilla* observed along Vaseux Lake, thought to possibly be bushy cinquefoil (*P. paradoxa*; CDC Red list), was identified as biennial cinquefoil (*Potentilla biennis*; CDC Yellow list). Biennial cinquefoil is relatively common along the lake shorelines in the south Okanagan Valley.

A few perigynia were collected from a tall species of *Carex*, in relatively poor condition due to the lateness of the year. The perigynia were unusual in that they had long and somewhat curved apical teeth. Only two BC sedge species have these distinctive perigynia, bearded sedge (Table 1; CDC Red list) and awned sedge (*C. atherodes*; CDC Yellow list). Curtis Björk tentatively identified the perigynia as being from awned sedge.

A species of duckweed (*Lemna* sp.) was collected in a small water pocket along the edge of Osoyoos Lake. It was smaller than *Lemna minor* which was growing with it. This species may be least duckweed (*Lemna minuta*; not yet confirmed for BC but on the CDC website although not given a conservation ranking) or *L. valdiviana* (no common name; not yet reported from BC or Washington but present in Montana). Adolf Ceska (pers. comm. 2013) noted that it may also be immature turion duckweed (*L. turionifera*; CDC Yellow list). Some material that was collected is still living in a small aquarium and will be sent to an expert if and when possible for identification.

Small collections of two potential at risk vascular plants were made along the western shore of Vaseux Lake for identification. A species of *Eleocharis* was identified as creeping spike-rush (*E. macrostachya*; CDC Yellow list) and a dodder identified as button-bush dodder (*Cuscuta cephalanthi*; an exotic, sometimes invasive species).

3.2 Habitat Assessment

A number of threats were observed to the habitats of at risk plant species during the 2013 surveys. Most evident was the presence of invasive exotic plants in many of the shoreline and associated riparian areas, in particular reed canarygrass (*Phalaris arundinacea*) and other grasses. Yellow iris (*Iris pseudacorus*) is common along the shorelines of Vaseux Lake, especially in the two lagoons at the south end (Fig. 18). It was also observed at a few locations along Osoyoos Lake. Shoreline maintenance along portions of Willow Beach and Christie Memorial Park has impacted the habitats there. Livestock are present in the seasonally wet area north of Osoyoos Lake and are doing some trampling damage to the habitats. Wave action has caused considerable erosion forming cut banks alongside some portions of both lakes (Fig. 19).

A number of habitats of high potential for at risk plants were observed along the northern shores of Osoyoos Lake. Many small beaches appear highly suitable as do some of the in-shore shrub-dominated habitats (especially if sandbar willow, *Salix exigua*, is common e.g., from WPs 210 to 213). The seasonally wet depressions south of the Hayne's Lease wetlands are high potential habitat for inshore at risk species (Fig. 20).

In contrast, few sites contained suitable habitat for at risk species along Vaseux Lake. Many of the shorelines are rocky and steep, or dominated by dense vegetation, often including exotic invasive species. Sites along Vaseux Lake that appear to have high potential for at risk plants include:

1. A relatively flat and sandy site near the mouth of the Okanagan River at the south end of the lake (WPs239 to 241; Fig. 21).
2. Open forest, shrub-dominated sites that appear to have high potential for giant helleborine (*Epipactis gigantea*; CDC Blue list); many of its associated plant species are present there (WPs243 and 244).
3. A sandy-fine gravel beach fronting private land adjacent to the Franmar site (WPs273 and 274; Fig. 22).
4. Various sandy beaches and inshore shrub-dominated habitats on islands and along the shore at the north end of the lake (WPs288 to 291; Fig. 23).

Figure 18. Large patch of yellow iris along edge of lagoon at south end of Vaseux Lake (T. McIntosh).

Figure 19. Cut banks alongside eastern shore of Vaseux Lake (WP275; J. Symonds).

Figure 20. View towards seasonally wet depressions at north end of Osoyoos Lake (WP275; T. McIntosh).

Figure 21. High potential habitat at the south end of Vaseux Lake (WP239; J. Symonds).

Figure 22. High potential habitat at the south end of Vaseux Lake (WP239; J. Symonds).

Figure 23. High potential sandy beach and inshore habitat on island at the north end of Vaseux Lake (WP288; J. Symonds).

3.3 Additional Observations of At Risk Species

Two at risk animals were observed during the surveys at both Osoyoos Lake and Vaseux lake. Numerous shells and live individuals of Rocky Mountain Ridged Mussel (*Gonidea angulata*; CDC Red list) were observed in shallow waters (Fig. 24). Two shells of mature Painted Turtle (*Chrysemys picta*; Population 2 - Intermountain - Rocky Mountain Population; CDC Blue list) were found on land (Fig. 25). Both are federally listed as Special Concern in SARA.

Figure 24. Shell of Rocky Mountain Ridged Mussel (WP 213; J. Symonds).

Figure 25. Painted Turtle shell (WP 197; J. Symonds).

4 Discussion and Recommendations

4.1 At Risk Plant Species

Seven at risk plants and two animals were observed during 2013 surveys of foreshore and associated riparian habitats along north end of Osoyoos Lake and portions of Vaseux Lake. The majority of these species were observed along Osoyoos Lake where substantially more suitable habitat is available. However, because the 2013 surveys were limited in time and scope, and were conducted later in the season than optimal, more at risk species are probably present, at least in the Osoyoos Lake study area. Unusually high water levels in Vaseux Lake in 2013 also may have inhibited germination of annual at risk species.

Some of the at risk plant species that were reported from earlier surveys near Willow Beach and the adjacent shorelines of Osoyoos Lake (McIntosh 2007; Table 1) were not observed at their known sites in 2013 (some of these plants were observed on private property in 2007 and these sites were not visited in 2013). These include cut-leaved water-parsnip, porcupine sedge, blue vervain, short-rayed aster, and bushy cinquefoil. In 2007, the first two species were observed near WP226 and blue vervain near WP230. Also, one location of red-rooted cyperus from 2007 near WP228 was not observed in 2013. However, small-flowered lipocarpha, observed in 2007 but not in 2009, was reported again in 2013. Also, population numbers of thyme-leaved spurge and awned cyperus were higher in 2013 than in 2009. Beach maintenance since 2009 appears to have greatly reduced the cover of exotic plants and opened up the sandy beach, most likely accounting for the recovery of these taxa.

The putative river bulrush remains to be confirmed. None of the bulrush populations were in flower, as is characteristic for this species, so only vegetative material was observed and positive identification was not possible (collections of a few sterile plants were made and an identification may be possible from this material). It may also be an exotic species, *Bolboschoenus glaucus*, which has been reported from a wetland east of Osoyoos and also must be considered as possibly more widespread in the south Okanagan Valley.

4.2 Habitat Assessment

A number of threats were observed to the habitats of at risk plant species in 2013, including the presence of invasive exotic plants, in particular reed canarygrass and yellow iris, shoreline maintenance, livestock, and lake wave action. These threats have both altered habitats, probably permanently at some sites, and decreased the range of at risk plant species in the study areas.

However, a number of habitats of high potential for at risk plants were observed during the study, especially along the north shore of Osoyoos Lake. These include both small beaches and in-shore shrub-dominated habitats. Seasonally wet depressions in the Hayne's Lease also have a high potential for at risk species.

4.3 Recommendations

1. Re-survey some sites:
   The 2013 surveys were conducted later in the season than optimal (mid August to late September is an optimal window for most riparian surveys), and some species may have been missed because they had degraded. Also, at least at Vaseux Lake, water levels may have been higher than normal in 2013 and seeds of some annual species may not have germinated. Therefore, it is recommended that some of the sites surveyed in 2013 be surveyed again in 2014 (including both sites where at risk species were observed as well as the potential sites listed in Section 3.2).

2. Survey additional sites for at risk plants:
   It is critical that at risk plant surveys continue in the south Okanagan Valley so that a better understanding of these species' ranges and associated habitats can be developed. Portions of Vaseux Lake and associated waterways, especially to the north, were not visited in 2013 and large areas of riparian habitat north of Osoyoos Lake (especially associated with the oxbows) remain unsurveyed.

3. Develop a monitoring protocol:
   The development of site- and species-specific monitoring protocols will help to better understand changes to populations and habitats of a particular at risk species through time. This protocol would include, but not be limited to, population counts, population health, habitat and threat descriptions, and developing photopoint locations (for repeatability of observations).

4. Consider transplanting at risk species to some high potential habitats:
   High potential habitats for at risk plant species have been observed, especially along the Osoyoos Lake shorelines. Transplanting and follow-up monitoring of some species, such as small-flowered lipocarpha (successfully grown in pots by T. McIntosh in Vancouver), can be considered. Methods for translocations should follow the Guidelines for Translocation of Plant Species at Risk in British Columbia (Maslovat 2009).

5 References

British Columbia Conservation Data Center (CDC). 2012. available at: www.env.gov.bc.ca/cdc/.

Maslovat, C. 2009. Guidelines for Translocation of Plant Species at Risk in British Columbia. Report prepared for the BC Ministry of the Environment.

McIntosh, T.T. 2007. Rare plants on the Willow Beach property, Osoyoos, BC. Report prepared for Pottinger Gaherty Environmental Consultants Ltd.

McIntosh, T.T. 2010. Foreshore Plant Species at Risk Inventory, Osoyoos Lake, BC. Report prepared for the BC Ministry of Environment.

Pottinger Gaherty Environmental Consultants Ltd. 2008. Draft environmental impact statement: Willow Beach. Report prepared for Willow Beach (GLD) Developments Ltd.

U.S. Department of the Interior (Bureau of Land Management). 2009. Instruction Memorandum No. CA-2009-026, Survey Protocols Required for NEPA and ESA Compliance for BLM Special Status Plant Species.