Species at Risk Voluntary Stewardship Practices for:

Guidance for Restoration Activities in Riparian Areas

Produced in partnership by:

STEWARDSHIP CENTRE
FOR BRITISH COLUMBIA

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The Stewardship Centre for BC

The Stewardship Centre for BC (SCBC) was created to assist governments, businesses, conservation and environmental organizations, and citizens carry out stewardship activities in the most efficient, effective, and rewarding ways. A leader in promoting stewardship values as the foundation for sustainability, the SCBC wants to help make "shared stewardship" – the voluntary adoption of environmentally sustainable practices by all sectors of society – a reality in British Columbia.

We are committed to champion science-based best stewardship so that British Columbians understand, enjoy, and sustain healthy ecosystems through stewardship. As good stewardship relies on good decision- making, we work closely with our partners to develop innovative technical, educational, and capacity building resources. For more information about the Stewardship Centre, go to www.stewardshipcentrebc.ca.

A riparian area newly planted with willow, cottonwood, and western red cedar.

Photos by Detmar Schiwchtenberg.

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Preface

This Stewardship Practices guide for species at risk and other wildlife affected by riparian area activities presents options and examples of good stewardship practices to reduce impacts to these species. The guide describes different activities people can undertake to help conserve wildlife and their habitat and also provides links to resources to take action. This guide is one of a series of guides developed by the Stewardship Centre to address threats to wildlife and species at risk. Other guides in this series include:

- Species at Risk Voluntary Stewardship Practices for ***Riparian Areas in Settled Landscapes***
- Species at Risk Voluntary Stewardship Practices for*: **Drainage Maintenance in Agricultural Waterways***
- Species at Risk Voluntary Stewardship Practices for: ***Reducing Domestic and Feral Cat Predation***
- Species at Risk Voluntary Stewardship Practices for: ***Climbing***
- Species at Risk Voluntary Stewardship Practices for: ***Reducing Small Animal Road-kill.***

About this Document

This guide was designed to provide:

- Private landowners with information they can use to inform their actions to conserve species at risk
- Industry specific stewardship practices that the agricultural sector can consider when making land use decisions and developing land management plans
- Local governments with information to consider when developing mechanisms, such as bylaws and community plans, that help protect species at risk
- Information for conservation and stewardship organizations that can facilitate their work.

This guide encourages people to take **voluntary stewardship actions**, called stewardship practices, to safeguard wildlife and species at risk. Stewardship can be broadly defined as an ethic that promotes the responsible use, protection, and management of the natural environment through conservation and sustainable best practices.

This guide provides specific guidance for restoration activities in riparian areas. Companion documents entitled *Stewardship Practices for Riparian Areas in Settled Landscapes* and *Stewardship Practices for Drainage Maintenance* provide further information on effective stewardship practices.

To help implement these stewardship practices additional information resources are provided at the end of the guide.

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Guidance for Habitat Restoration Activities in Riparian Areas

Plant Native Vegetation

Native species will provide the most habitat value. When re-establishing native riparian areas, early successional or 'pioneer' species such as willows, alder, native roses, aspen or cottonwood and other sun-loving species are likely to do best. Attempts to establish understory plants, particularly herbaceous or shrubby species are likely to fail, wasting effort and money. Planting is best done in early spring or in fall, although winter planting works well in warmer areas along the coast.

Willow, cottonwood and red osier dogwood have the additional advantage of readily rooting from cuttings or 'whips'. These can be harvested locally at much less expense than purchasing potted stock. Local seed sources are always preferable, as the plants will be well adapted to site conditions. For large sites, wholesale nurseries are often willing to harvest local seeds and grow potted stock from them, although one to two years lead time is required.

Use relatively large stock, as survivorship is typically much higher. For plantings in habitats dominated by invasive reed canary grass or Himalayan blackberry, trees in 5 gallon pots and shrubs in two gallon pots and at least 1 metre of top growth are preferred. In these conditions willow and cottonwood whips 1.5 to 2 m in length are best. Smaller plant material is generally overwhelmed by the grasses within the first year. High density plantings (e.g. 2 trees and 4 shrubs per $10m^2$) are also preferable, as their habitat value is higher and invasive species will be outcompeted more readily.

Annual maintenance of plantings will likely be required for at least five years, particularly in areas dominated by invasive species such as Himalayan blackberry.

Thick plantings of relatively large stock have higher survival rates. On agricultural lands an outer row of conifers will minimize debris fall on fields and clearly define the edge of the riparian area. Where shading is a concern lower growing species should be used.

How Wide Should A Riparian Area Be?

A large body of scientific research on the effectiveness of riparian buffers in protecting the aquatic habitats has been published. The general consensus is that, to fully protect aquatic habitats from the impacts of adjacent land uses, buffers need to be at least 30 m wide. Within this zone, it is also clear that the areas closest to the water are more important than those further out. For example a 15 m buffer provides much more than half the benefit of a 30 m buffer. Even a narrow 5 m buffer will provide important benefits for species at risk.

The Riparian Area Regulation prescribes an assessment methodology for properties proposing development or redevelopment of areas adjacent to watercourses (see WEB Resources below). These assessments must be completed by a qualified professional. **Minimum setbacks for agricultural buildings (except farm residences) are prescribed by the Ministry of Agriculture.**

Protect Plantings from Wildlife and Livestock

Little is more depressing than returning to a freshly planted site to find stumps, or wilted leaves on lifeless trees. Guarding trees and shrubs from wildlife can consume one third to one half of a planting budget, which seems very expensive until one considers that mortality is often close to 100% without these measures.

Well secured fencing encircling trees is an effective way of preventing beaver damage.

Beavers will take trees and large stemmed shrubs within 50 m of a waterway. They have a preference for willows, cottonwood and alder, but if little else is available will take even spruce, cedar and other conifers. Plants can be protected by fencing, which should be at least one meter high, with openings not more than 4 inches square, and be anchored to the ground with stakes or small diameter fence posts. It is best to encircle individual or small groups of trees. This allows wildlife free movement through the habitat and is more secure. If a fence encircling a large number of plants fails (e.g., a tree falls on it), everything within it may be lost.

Voles eat the inner bark of trees and shrubs during the winter and are typically at very high densities in riparian areas dominated by thick grass cover. Plastic guards can be installed to prevent them from girdling plants (removing a band of bark and cambium around the entire circumference of the stalk) and killing them. Spiral-style guards are best, as they will expand with trunk growth.

Fencing livestock out of agricultural riparian areas prevents damage to native vegetation or allows it to recover from past damage. It also improves water quality, reducing entry of nutrients and disease causing organisms including faecal coliforms, giardia, and cryptosporidium (Sunohara et al., 2011). It also benefits animal health, particularly foot and hoof problems, by keeping them out of the water and

mud. Drinking water can be supplied to animals using commercially available off-channel watering stations (some of which are solar powered) or by limiting access to a very small area of the channel. Diverting surface water to a watering station may require a license under the BC Water Act.

A riparian area before (top) and three years after (bottom) cattle were fenced out of a riparian area. Willows and other native species were planted in the riparian area at the time of fencing. Photos courtesy of the Langley Environmental Partners Society.

Install Large Woody Debris

Natural riparian areas in forested landscapes are thick with branches, trees, uprooted stumps, downed logs and standing snags. Dead wood is a fundamental part of these habitats. Birds excavate cavities for nests, bats roost under loose bark, and vast numbers of insects are produced, providing food for vertebrates. Amphibians and reptiles find cover under logs, and an array of plants, lichens and mosses are nourished by decaying wood.

Most riparian areas in agricultural and urban settings are nearly devoid of large woody debris. If riparian restoration sites are simply planted with native trees, more than a century will pass before they contain a quantity of dead wood approaching that of a natural riparian forest.

Large woody debris is readily available, usually for the cost of trucking, from land clearing companies and debris traps at dams in large rivers. Typically an excavator is required to place these materials in the restoration site. If large woody debris is placed within the channel or floodplain an approval or authorization from federal or provincial authorities may be required (see Appendix A: Existing Regulation and Policy).

Tips on installation:

- Debris must be placed ground high enough that it will not float away during flood events, or be anchored in place.
- Snags can be installed in soft ground by an excavator. The thicker end is grasped and the narrower end driven in a minimum of 2.5 m. Do not attempt to install them vertically, it takes too much time and will appear less natural.

- Logs placed with the tips in the water and the bases on high ground provide important cover for animals moving between aquatic and upland areas.
- Place debris and snags in clusters rather than evenly spacing them. Dense patches of debris are more valuable as habitat than dispersed pieces are.
- Gather the smaller branches that inevitably litter the worksite into brush piles above the high water mark. They will be well used as cover by a variety birds and mammals.
- Use logs to link patches of debris or brush piles to one another

Large woody debris was trucked in and placed with an excavator in this riparian area before native trees and shrubs were planted.

Create Pits and Mounds

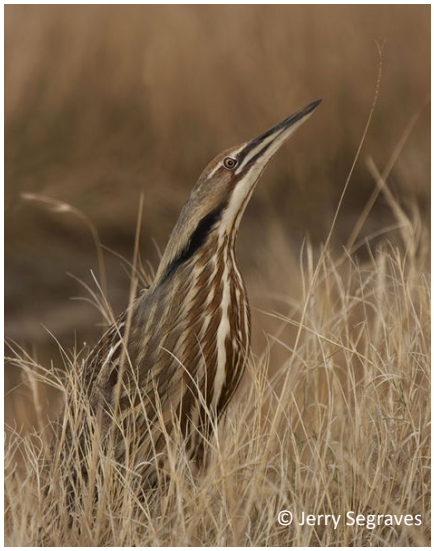
Uprooted stumps, decomposing logs, abandoned stream channels all create a complex topography in natural riparian areas. Pits that hold water during wet periods, mounds that dry out more quickly, and variable slope gradients provide a wide range of micro-habitats that support more species. In contrast, cleared riparian areas in settled landscapes are typically graded flat or have a smooth slope. Riparian naturalization projects that aim to restore biodiversity can recreate a complex topography by digging small pits that mimic those created by tree-fall, and piling the excavated material into small mounds. Soils should be left loose and rough. This is best done in conjunction with the installation of large woody debris, as described above.

Small pits and mounds were dug by an excavator as it placed large woody debris in this project.

Create Riparian Wetlands

Wetlands within the riparian area provide habitat for additional species and life stages. For example, many stream fish like Cutthroat Trout move into these 'off-channel' wetlands to escape strong currents and predators during cold winter weather when they are not able to feed or move much. Construction of such ponds and wetlands is a common and effective fisheries habitat enhancement method. If the wetland will connect to existing water bodies, approval will likely be required from regulatory agencies (see Existing Regulations and Legislation Appendix A).

This small wetland was built in a low corner of a pasture within the riparian area of a creek in Langley.



Riparian Wetlands are widely used by overwintering fish and by breeding amphibians and birds, including the Western Toad and the American Bittern.

Appendix A: Existing Regulation and Policy

If clearing existing riparian vegetation, building structures or constructing habitat within a riparian area is contemplated, a number of laws and regulations may apply. **Depending on project complexity and resources available, it may be advisable to engage professional consultants to handle permit applications.**

Government	Legislation	Permits/Authorizations
BC	Water Act	Section 9 Authorization required for works 'in or about' a stream.
	Fish Protection Act	The Riparian Area Regulation (RAR) protects and may require restoration of riparian area vegetation during non-agricultural land development including activities such as adding decks or docks. Setbacks for agricultural buildings depend on the type of building and watercourse and vary from 5 to 30 m. Although the RAR is Provincial, it is administered by Local Governments.
Federal	Fisheries Act	Removal of existing riparian vegetation has the potential to harm fish habitat and depending on the circumstances may require authorization under the habitat protection provisions of the *Fisheries Act*. For the most current information on *Fisheries Act* reviews and permitting processes refer to DFO's website: http://www.dfo-mpo.gc.ca/habitat/habitat-eng.htm.
	Species at Risk Act (aquatic species)	Killing, harming, harassing, capturing, taking, collecting or possessing any aquatic Endangered, Threatened or Extirpated aquatic species protected under the Species at Risk Act is prohibited. As a result, a permit may be required for activities that may affect an aquatic species at risk (http://www.dfo-mpo.gc.ca/species-especes/permits-permis/permits-eng.htm). Destruction of an aquatic species at risk's identified and protected critical habitat is prohibited. Activities can take place in critical habitat, but these activities must occur in ways that do not result in destruction. For information on critical habitat refer to DFO's website: http://www.pac.dfo-mpo.gc.ca/consultation/sara-lep/orders-decrets-eng.htm .
	Species at Risk Act (terrestrial species)	It is prohibited to kill, harm, harass, collect or possess a migratory bird that is listed as Endangered, Threatened or Extirpated. Destroying the nest or residence of those listed migratory birds is also prohibited. Permits may be issued for certain purposes: see http://www.sararegistry.gc.ca/sar/permit/permits_e.cfm for more information. Critical habitat is identified in final recovery strategies and action plans for all groups of listed species at risk. There are a variety of ways critical habitat may be protected on non-federal lands. Voluntary stewardship activities can help prevent destruction of critical habitat. Depending on the species, provincial laws may apply, or there could be a federal regulation or order in place which prohibits destruction of critical habitat. Some activities may take place in critical habitat, but must occur in ways that do not result in destruction of critical habitat. For more information contact your regional Environment Canada office and visit www.sararegistry.gc.ca.
	Migratory Bird Act	General prohibitions under the Act and its regulations protects most species of migratory birds, and their nests and eggs, anywhere they are found in Canada, regardless of ownership. The deposit of substances harmful to migratory birds in waters or areas frequented by them is also prohibited. Environment Canada recommends that you:

		1. Know your legal obligations; 2. Avoid engaging in potentially destructive or disruptive activities in key sensitive periods and locations, in order to reduce the risk of affecting birds, their nests or eggs; 3. Develop and implement appropriate preventive and mitigation measures to minimize the risk of incidental take and to help maintain sustainable populations of migratory birds. Note that appropriate measures need to be decided on a case-by-case basis. It is the responsibility of the individual or company undertaking the activities to determine these measures. For more information, please visit the information page on the MCBA: http://www.ec.gc.ca/Nature/default.asp?lang=En&n=7CEBB77D-1 and the EC Incidental Take website: http://www.ec.gc.ca/paom-itmb/default.asp?lang=En&n=C51C415F-1
Local Government	Tree Bylaws Development Permit Processes	Local governments may regulate removal of trees through a dedicated bylaw and/or through development permit processes. Details differ widely among jurisdictions, so it is prudent to check with the relevant municipality or regional district.

Appendix B: Web Resources

Riparian Stewardship

Cows and Fish http://www.cowsandfish.org/

Agroforestry Industry Development Initiative http://www.woodlot.bc.ca/agroforestry/whatis.htm

Center for Wetlands and Stream Restoration http://www.wetlandsandstreamrestoration.org/

BC Cattlemen's Association Farmland-Riparian Interface Stewardship Program
http://www.cattlemen.bc.ca/frisp.htm

BC Riparian Area Regulation Website and Guidebook
http://www.env.gov.bc.ca/habitat/fish_protection_act/riparian/riparian_areas.html

BC Ministry of Agriculture Riparian Website http://www.al.gov.bc.ca/resmgmt/riparian/index.htm

BC Invasive Plant Council: http://www.bcinvasives.ca/

BC Ministry of the Environment Stewardship Resources http://www.env.gov.bc.ca/wld/info.htm#

Stewardship Center for BC http://www.speciesatrisk.bc.ca/

Species at Risk

SARA and You private landowner information: www.sararegistry.gc.ca/involved/you/privland_e.cfm

BC Conservation Data Centre www.**env.gov.bc.ca**/cdc

Funding Sources:

Habitat Stewardship Program funds stewardship activities on private land: www.ec.gc.ca/hsp-pih/

EcoAction Community Funding Program provides financial support for projects that have measurable, positive impacts on the environment: www.ec.gc.ca/ecoaction/

Tax Incentives:

Ecological Gifts Program offers significant tax benefits to landowners who donate ecologically sensitive land or a partial interest in land http://www.ec.gc.ca/pde-egp/

Land Trust Alliance provides support for landowners to make charitable donations of ecologically sensitive land http://ltabc.ca/

Appendix C: Species at Risk Potentially Impacted by Riparian Management in Settled Landscapes

English Name	Scientific Name	BC List	COSEWIC	SARA
Mammals				
Pacific Water Shrew	*Sorex bendirii*	Red	E	1
American Water Shrew, *brooksi* subspecies	*Sorex palustris brooksi*	Red		
Mountain Beaver, *rainieri* subspecies	*Aplodontia rufa rainieri*	Blue	S	1
Mountain Beaver, *rufa* subspecies	*Aplodontia rufa rufa*	Blue	S	1
Roosevelt Elk	*Cervus canadensis roosevelti*	Blue		
Snowshoe Hare, *washingtonii* subspecies	*Lepus americanus washingtonii*	Red		
Ermine, *anguinae* subspecies	*Mustela erminea anguinae*	Blue		
Long-tailed weasel, *altifrontalis* subspecies	*Mustela frenata altifrontalis*	Red		
Western Small-footed Myotis	*Myotis ciliolabrum*	Blue		
Keen's Myotis	*Myotis keenii*	Red	D	3
Fringed Myotis	*Myotis thysanodes*	Blue	D	3
Western Harvest Mouse	*Reithrodontomys megalotis*	Blue	S	1
Preble's Shrew	*Sorex preblei*	Red		
Olympic Shrew	*Sorex rohweri*	Red		
Trowbridge's Shrew	*Sorex trowbridgii*	Blue		
Nuttall's Cottontail	*Sylvilagus nuttallii*	Blue	S	1
Birds				
Nelson's Sparrow	*Ammodramus nelsoni*	Red	N	
Great Blue Heron, *fannini* subspecies	*Ardea herodias fannini*	Blue	S	1
Great Blue Heron, *herodias* subspecies	*Ardea herodias herodias*	Blue		
American Bittern	*Botaurus lentiginosus*	Blue		
Black-crowned Night-heron	*Nycticorax nycticorax*	Red		
Le Conte's Sparrow	*Ammodramus leconteii*	Blue		
Ruby-throated Hummingbird	*Archilochus colubris*	Blue		
Short-eared Owl	*Asio flammeus*	Blue	S	1
Rough-legged Hawk	*Buteo lagopus*	Blue	N	
Swainson's Hawk	*Buteo swainsoni*	Red		
Green Heron	*Butorides virescens*	Blue		
Yellow-billed Cuckoo	*Coccyzus americanus*	Red		
Olive-sided Flycatcher	*Contopus cooperi*	Blue	T	1
Northern Pygmy-Owl, *swarthi* subspecies	*Glaucidium gnoma swarthi*	Blue		

Barn Swallow	*Hirundo rustica*	Blue	T	
Yellow-breasted Chat	*Icteria virens*	Red	E	1
Hudsonian Godwit	*Limosa haemastica*	Red		
Western Screech-Owl, *kennicottii* subspecies	*Megascops kennicottii kennicottii*	Blue	T	1
Western Screech-Owl, *macfarlanei* subspecies	*Megascops kennicottii macfarlanei*	Red	T	1
Lewis's Woodpecker	*Melanerpes lewis*	Red	T	1
Band-tailed Pigeon	*Patagioenas fasciata*	Blue	S	1
Purple Martin	*Progne subis*	Blue		
Cape May Warbler	*Setophaga tigrina*	Red		
Black-throated Green Warbler	*Setophaga virens*	Blue		
Sharp-tailed Grouse, *columbianus* subspecies	*Tympanuchus phasianellus columbianus*	Blue		
Barn Owl	*Tyto alba*	Blue	T	1
Common Nighthawk	*Chordeiles minor*	Yellow	T	1
Reptiles				
Western Rattlesnake	*Crotalus oreganus*	Blue	T	1
Gopher Snake, *deserticola* subspecies	*Pituophis catenifer deserticola*	Blue	T	1
Western Skink	*Plestiodon skiltonianus*	Blue	S	1
Amphibians				
Western Toad	*Anaxyrus boreas*	Blue	S	1
Wandering Salamander	*Aneides vagrans*	Blue		
Northern Red-legged Frog	*Rana aurora*	Blue	S	1
Oregon Spotted Frog	*Rana pretiosa*	Red	E	1
Fish				
Chiselmouth	*Acrocheilus alutaceus*	Blue	N	
Salish Sucker	*Catostomus* sp. 4	Red	T	1
Northern Redbelly Dace	*Chrosomus eos*	Blue		
Shorthead Sculpin	*Cottus confusus*	Blue	S	1
Columbia Sculpin	*Cottus hubbsi*	*Blue*	*S*	*1*
Brassy Minnow - Pacific Group	*Hybognathus hankinsoni - Pacific group*	*Blue*		
Pearl Dace	*Margariscus nachtriebi*	Blue		
Cutthroat Trout, *clarkii* subspecies	*Oncorhynchus clarkii clarkii*	Blue		
Cutthroat Trout, *lewisi* subspecies	*Oncorhynchus clarkii lewisi*	Blue	S	1
Nooksack Dace	*Rhinichthys cataractae - Chehalis lineage*	*Red*	*E*	*1*
Bull Trout	*Salvelinus confluentus*	Blue	S	
Bull Trout - Coastal Lineage	*Salvelinus confluentus - coastal lineage*	Blue	S	
Bull Trout - Interior Lineage	*Salvelinus confluentus - interior*	*Blue*	*S*	

	lineage			
Speckled Dace	*Rhinichthys osculus*	Red	E	1
Dragonflies and Butterflies				
Emma's Dancer	*Argia emma*	Blue		
River Jewelwing	*Calopteryx aequabilis*	Red		
Beaverpond Baskettail	*Epitheca canis*	Blue		
Olive Clubtail	*Stylurus olivaceus*	Red	E	
Autumn Meadowhawk	*Sympetrum vicinum*	Blue		
Vivid Dancer	*Argia vivida*	Red	C	
Common Ringlet, *benjamini* subspecies	*Coenonympha tullia benjamini*	Blue		
Pronghorn Clubtail	*Gomphus graslinellus*	Blue		
Viceroy	*Limenitis archippus*	Red		
Dione Copper	*Lycaena dione*	Red	C	
Lilac-bordered Copper	*Lycaena nivalis*	Blue		
Western River Cruiser	*Macromia magnifica*	Blue		
Blue Dasher	*Pachydiplax longipennis*	Blue		
Greenish Blue, *insulanus* subspecies	*Plebejus saepiolus insulanus*	Red	E	1
Tawny-edged Skipper, *themistocles* subspecies	*Polites themistocles themistocles*	Blue		
Coral Hairstreak, *titus* subspecies	*Satyrium titus titus*	Red		
Mormon Fritillary, *eurynome* subspecies	*Speyeria mormonia eurynome*	Red		
Molluscs				
Rocky Mountain Ridged Mussel	*Gonidea angulata*	Red	E	1
Swamp Fingernailclam	*Musculium partumeium*	Red		
Rocky Mountain Fingernailclam	*Sphaerium patella*	Red		
Ashy Pebblesnail	*Fluminicola fuscus*	Red		
Attenuate Fossaria	*Fossaria truncatula*	Blue		
Barren Juga	*Juga hemphilli*	Red		
Umbilicate Sprite	*Promenetus umbilicatellus*	Blue		
Abbreviate Pondsnail	*Stagnicola apicina*	Blue		
Warty Jumping-slug	*Hemphillia glandulosa*	Blue	S	1
Black Gloss	*Zonitoides nitidus*	Blue		
Vascular Plants				
scarlet ammannia	*Ammannia robusta*	Red	E	1
chaffweed	*Anagallis minima*	Blue		
cut-leaved water-parsnip	*Berula erecta*	Blue		
tall beggarticks	*Bidens vulgata*	Red		
western water-milfoil	*Myriophyllum hippuroides*	Blue		
Ussurian water-milfoil	*Myriophyllum ussuriense*	Blue		
toothcup meadow-foam	*Rotala ramosior*	Red	E	1

pink water speedwell	*Veronica catenata*	Red		
nettle-leaved giant-hyssop	*Agastache urticifolia*	Blue		
Canada anemone	*Anemone canadensis*	Blue		
riverbank anemone	*Anemone virginiana* var. *cylindroidea*	Blue		
western mugwort	*Artemisia herriotii*	Red		
angled bittercress	*Cardamine angulata*	Blue		
Atkinson's coreopsis	*Coreopsis tinctoria* var. *atkinsoniana*	Red		
Joe-pye weed	*Eutrochium maculatum* var. *bruneri*	Red		
Oregon ash	*Fraxinus latifolia*	Red		
bog bird's-foot lotus	*Hosackia pinnata*	Red	E	1
Pacific waterleaf	*Hydrophyllum tenuipes*	Red		
orange touch-me-not	*Impatiens aurella*	Blue		
spurless touch-me-not	*Impatiens ecalcarata*	Blue		
false-pimpernel	*Lindernia dubia* var. *anagallidea*	Blue		
streambank lupine	*Lupinus rivularis*	Red	E	1
finebranched popcornflower	*Plagiobothrys leptocladus*	Red		
water-plantain buttercup	*Ranunculus alismifolius* var. *alismifolius*	Red	E	1
peach-leaf willow	*Salix amygdaloides*	Red		
meadow willow	*Salix petiolaris*	Blue		
American sweet-flag	*Acorus americanus*	Blue		
river bulrush	*Bolboschoenus fluviatilis*	Red		
bearded sedge	*Carex comosa*	Red		
green-sheathed sedge	*Carex feta*	Blue		
green-fruited sedge	*Carex interrupta*	Red		
lakeshore sedge	*Carex lenticularis*	Blue		
pointed broom sedge	*Carex scoparia*	Blue		
many-headed sedge	*Carex sychnocephala*	Blue		
Nuttall's waterweed	*Elodea nuttallii*	Blue		
marsh muhly	*Muhlenbergia glomerata*	Blue		
sheathing pondweed	*Stuckenia vaginata*	Blue		
Geyer's onion	*Allium geyeri* var. *tenerum*	Blue		
porcupine sedge	*Carex hystericina*	Blue		
red-rooted cyperus	*Cyperus erythrorhizos*	Red		
bent spike-rush	*Eleocharis geniculata*	Red	E	1
ovate spikerush	*Eleocharis ovata*	Red		
beardless wildrye	*Elymus curvatus*	Red		
giant helleborine	*Epipactis gigantea*	Blue	S	3
small-flowered lipocarpha	*Lipocarpha micrantha*	Red	E	1

nodding semaphoregrass	*Pleuropogon refractus*	Blue		
Smith's fairybells	*Prosartes smithii*	Blue		
prairie wedgegrass	*Sphenopholis obtusata*	Red		
Nuttall's quillwort	*Isoetes nuttallii*	Blue		
Mexican mosquito fern	*Azolla mexicana*	Red	T	1
upswept moonwort	*Botrychium ascendens*	Red		
Linear-leaf moonwort	*Botrychium lineare*	Red		
stalked moonwort	*Botrychium pedunculosum*	Red		
crested wood fern	*Dryopteris cristata*	Blue		

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