

Montana Department of Transportation Stream Mitigation Monitoring Report

NORTH FORK BEAR CREEK MITIGATION SITE

Project Overview

MDT Project Number: NH-7-1(114)56 / UPN # 2015003

Watershed: Watershed #3 - Lower Clark Fork

Monitoring Year: 2021

Years Monitored: 9th year of monitoring

Corps Permit Number: NWO-1997-90821-MTH

Monitoring Conducted By: Confluence Consulting Inc.

Monitoring Dates: August 3, 2021

Purpose of the approved project:

As part of this project, the Montana Department of Transportation (MDT) requested authorization to replace bridges at North and South Fork Bear Creek, construct a new stream channel segment, and to place 0.07 acres of fill within jurisdictional wetlands. The North Fork Bear Creek work included removal and replacement of the U.S Highway 93 Bridge, placement of rock around the new bridge abutments, creation of a new stream channel alignment, filling the deactivated stream segment, and removal of gabions downstream of the bridge. Stream mitigation was required to offset placement of riprap and other fill materials within the ordinary high water mark of the stream corridor.

Site Location:

Upstream Coordinates: 46.404152, -114.145398

Downstream Coordinates: 46.404397, -114.144191

County: Ravalli **Nearest Town:** Victor, MT

Map Included: Figure 1 on page #6.

Mitigation Site Construction Started: 2011 **Construction Ended:** 2011

Dates of any recent corrective or maintenance activities (since previous report):

Activity: Weed Control **Date:** Spring 2021

Specific recommendations for additional corrective actions: Continue weed treatment in 2022.

Previous Monitoring Reports and Methods Descriptions:

<https://www.mdt.mt.gov/publications/brochures/stream-mitigation.shtml>

Requirements (from approved mitigation plan, banking instrument, or DA permit conditions)

Monitoring Period: 5 years from construction completion or until concurrence by US Army Corps of Engineers (USACE).

Performance Standards:

Results from the ninth year of monitoring indicate that the site is meeting three of the four established performance standards (Table 1). Ten years post-construction, the site has greater than 50% vegetative cover from desirable, non-noxious, perennial species; greater than 25%

woody vegetation cover; and greater than 75% of the stream banks are stable. Percent cover of noxious weeds failed to meet the success criteria of <10%.

Table 1. Summary of Performance Standards.

Performance Standards	Success Criteria	Criteria Achieved Y/N	Discussion
Riparian Cover	Greater than 50% aerial coverage of desirable perennial plants, including seeded species and those colonizing from adjacent undisturbed habitats.	Y	Vegetative cover from desirable plant species was estimated at 59%
	Greater than 25% aerial coverage of woody riparian shrubs and/or trees.	Y	Woody riparian species cover estimated at 32% of project area, a 3% decrease since 2020.
	Less than 10% aerial coverage of site has Montana noxious weeds.	N	Noxious weed infestations cover approximately 11% of the project area.
Streambank Stability	Less than 25% of total bank length exhibiting signs of active erosion/cutting	Y	Unstable banks represent 19% of the bank length within the project area.

Summary Data

Riparian Vegetation Inventory

In 2021, total riparian cover the North Fork Bear Mitigation Site was 75%. Approximately 25% of the site was bare ground, 43% was vegetated by herbaceous species and 32% by woody species. Desirable non-noxious perennial plants, including trees, shrubs, forbs, and graminoids covered approximately 59% of the project site. The site exhibited a decrease in noxious weed cover, from 20% in 2020 to 11% in 2021, which more closely corresponds to the 10% cover threshold for noxious weeds at the site.

Percent cover of woody vegetation decreased by 3% since 2020. Woody cover is primarily being provided by shrub and tree species that existed prior to channel relocation, though some cover is also provided by volunteer shrub and sapling species that are colonizing the site. Although techniques used to install woody cuttings have resulted in very low survival rates, the combination of volunteer shrub establishment and mature tree cover currently stands at 35%, which exceeds the established success criteria for woody cover by 10%. Visual estimates of areal vegetative cover from 2013 through 2021 are summarized in Table 2.

Table 2. Percent cover estimates at the North Fork Bear Creek Stream Mitigation Site from 2013 through 2021.

Year	Total % Riparian Cover	% Bare Ground	% Woody Cover	% Noxious Weed Cover	% Annual/Biennial Cover	% Herbaceous Non-Noxious Perennial Cover	% Desirable Cover ¹
2013	90	10	27	35			
2014	90	10	30	35	*	*	*
2015	90	10	32	40	9	9	41
2016	92	8	34	45	7	7	40
2017	85	15	35	30	7	13	48
2018	85	15	36	30	7	13	48
2019	90	10	38	33	5	19	52
2020	80	20	35	20	7	25	53
2021	75	25	32	11	5	32	59

*Data not collected in 2013 or 2014

¹ % Desirable Cover = Total % Riparian Cover - % Noxious Weed Cover - % Annual/Biennial Cover

Appendix C includes a comprehensive list of plant species observed along the new channel alignment and riparian buffer areas from 2013 through 2021. The comprehensive list includes 123 species, representing an increase of 78 species since monitoring efforts began in 2013. No new species were observed during the 2021 site visit. In 2021, 40% of species observed were hydrophytic based on the 2018 National Wetland Plant List (USACE 2018).

Stream Bank Vegetation Composition

The vegetation on the upstream side of the bridge was dominated by non-native graminoids including *Poa compressa*, *Elymus repens*, and *Bromus inermis*. The relatively steep stream bank along north side of the channel, upstream of the Highway 93 Bridge may hinder the growth of riparian vegetation in this area. Downstream of the bridge, stream banks are less steep and are dominated by cottonwoods (*Populus* spp.) and grasses (*Poa* spp., *Elymus* spp., *Phleum pratense*, and *Phalaris arundinacea*).

Noxious Weed Inventory

Noxious weeds were estimated to cover 11% of the site during the 2021 monitoring event. Weeds were observed on both stream banks upstream and downstream of the Highway 93 Bridge. Nine infestations of Montana Listed Priority 2B noxious weeds were mapped within the project area in 2021. One Priority 1B noxious weed infestation (i.e., *Polygonum cuspidatum*) was also identified and mapped within the riparian corridor during the site visit (Table 3; Figure 2, Appendix A). Mapped observations occurred on both private land and in the MDT right-of-way (ROW) within the project area, and were assigned a cover class of “low” (1-5% cover) (Table 3; Figure 2, Appendix A). Numerous isolated noxious weed patches were also identified within the project area in small and assigned a cover class of “trace” (<1% cover), but were not mapped. In total, the area occupied by noxious weed infestations exceeds the 10% cover threshold established in the success criteria.

Two noxious weed species originally observed in 2014 (*Convolvulus arvensis* and *Cynoglossum officinale*) have not been observed during the past six monitoring events, and as a result, they are no longer considered present within the reach.

Table 3. Weeds observed within the North Fork Bear Creek riparian zone in 2021.

Category*	Scientific Name	Common Name
Priority 1B	<i>Polygonum cuspidatum</i>	Knotweed Complex
Priority 2B	<i>Berteroa incana</i>	Hoary False-Alyssum
	<i>Centaurea stoebe</i>	Spotted Knapweed
	<i>Cirsium arvense</i>	Canadian Thistle
	<i>Hypericum perforatum</i>	Common St. John's-Wort
	<i>Leucanthemum vulgare</i>	Ox-Eye Daisy
	<i>Potentilla recta</i>	Sulphur Cinquefoil
	<i>Tanacetum vulgare</i>	Common Tansy
Priority 3 State Regulated	<i>Bromus tectorum</i>	Cheatgrass

* Based on the MT Department of Agriculture 2019 Noxious Weed List

Woody Plant Survival

Attempts to establish woody riparian vegetation within the project reach included installing Cottonwood (*Populus* spp.) and willow (*Salix* spp.) cuttings along the banks upstream and downstream of the Highway 93 Bridge, but these efforts were largely unsuccessful. Only one of the cuttings has developed leafy stems, which have sprouted from the base of the plant. Upon inspection, all cuttings were installed to a depth of approximately one foot, with four to five feet of the stem extending above ground. High mortality of these cuttings is attributed to the shallow planting depth and inability of the cuttings to extend roots to meet the water table elevation.

Bank Erosion Inventory

The length of eroding stream bank slightly increased from 17% to just under 19% between the 2020 and 2021 monitoring events. Erosion has been noted on the downstream end of the project area for the last several years. In 2020, there was a 50' long segment of eroding bank documented on the south bank below the Highway 93 Bridge. This bank has stabilized some since the 2020 monitoring event, but still qualifies as eroding and the length of the eroding segment remains unchanged. No lateral migration was observed along this bank in 2021. A 25' section of the south bank below the bridge had eroded in 2020, and the length of that eroding bank has increased to 33' feet in the last year. The root wads that were placed along this bank to provide stability are still intact and in place, but the gravel and cobble surrounding the root wads has been scoured away. No signs of lateral retreat were observed on either of these banks in 2021.

Channel Form

The North Fork Bear Creek channel form did not change between the 2020 and 2021 monitoring events. The channel form changed significantly between the 2019 and 2020 monitoring events, and those channel form changes were persistent in 2021. The small

secondary channel that was observed upstream of the bridge in 2019 is still present but does not appear to be increasing in size or entraining more water when the creek is flowing.

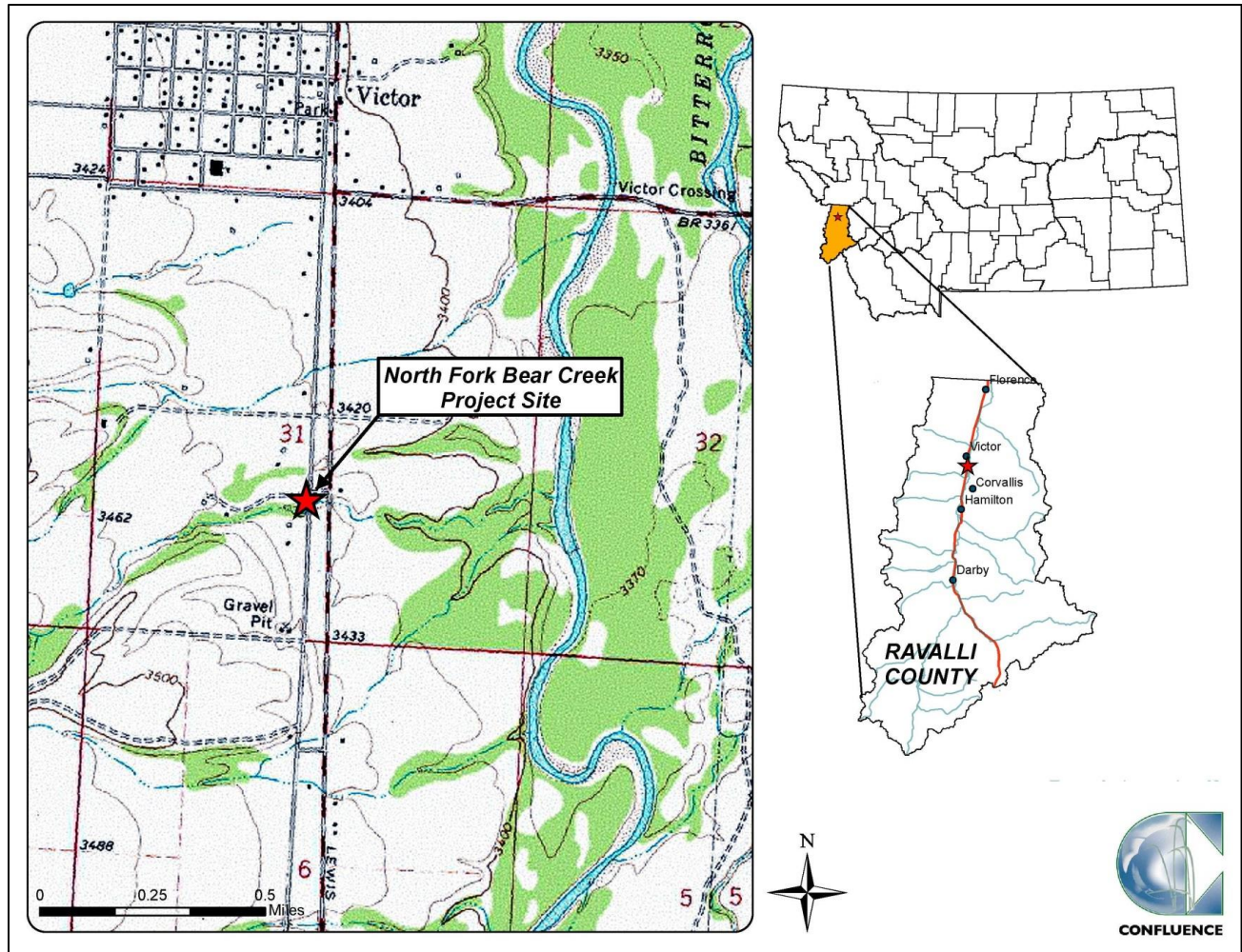
Conclusions

The site is meeting three of the four performance standards, the exception being the standard that requires less than 10% noxious weed cover within the riparian corridor. The percent cover of noxious weeds has decreased by 9% since 2020 and is now just 11%, which indicates the site is moving closer to achieving this performance standard. Continued weed control efforts in 2022 are likely to help MDT achieve this performance.

Given that only a small increase in bank erosion and no changes in channel form were observed in 2021, no immediate concerns exist over the stability of the project reach. One of the two eroding banks observed appears to be trending toward stability and the other bank does not show signs of continued lateral retreat.

Maps, Plans, Photos:

Figure 1. Site Location Map



Project Area Maps/Figures: See Appendix A (Figure 2 – 2021 Monitoring)

Photos: See Appendix B (Project Area Photos)

Comprehensive Plant Species List: See Appendix C (Table C-1)

Plans: See Appendix C of the North Fork Bear 2013 Monitoring Report

https://www.mdt.mt.gov/other/webdata/external/planning/STREAM-MITIGATION/2013_REPORTS/2013_NF_BEAR_CREEK_MONITORING_REPORT.PDF

References

- Montana Department of Agriculture.** June 2019. *Montana Noxious Weed List..* Accessed September 2021 at:
<https://agr.mt.gov/Portals/168/Documents/Weeds/2019%20Montana%20Noxious%20Weed%20List.pdf?ver=2019-07-02-095540-487>
- U.S. Department of Agriculture, Natural Resource Conservation Service (USDA, NRCS).** 2021. *The PLANTS Database.* National Plant Data Team, Greensboro, NC 27401-4901 USA. Accessed September 2021 at: <http://plants.usda.gov>
- U.S. Army Corps of Engineers (USACE).** 2018. *National Wetland Plant List (Version 3.4)*, prepared by U.S. Army Corps of Engineers, U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH.

APPENDIX A

PROJECT AREA MAPS

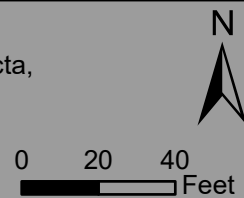
MDT Streams Mitigation Monitoring
North Fork Bear Creek
Ravalli County, Montana



Legend

- Photo Points
- Centaurea stoebe*
- Polygonum cuspidatum*
- Eroding Bank
- Hypericum perforatum*

Note: *Cirsium arvense*, *Berteroa incana*, *Potentilla recta*, *Leucanthemum vulgare*, and *Tanacetum vulgare* were observed in trace amounts and were not mapped.



**2021 Monitoring
NF Bear Creek**

Figure 2

Date: 9/16/2021

NFBear_features2021.mxd

APPENDIX B

PROJECT AREA PHOTOGRAPHS

MDT Streams Mitigation Monitoring
North Fork Bear Creek
Ravalli County, Montana

PHOTO INFORMATION

PROJECT NAME: North Fork Bear Creek Stream Mitigation Site

DATES: 2013 and 2021 Monitoring Events



2013
Photo Point 1.1: View of tributary/culvert entering from west. **Compass: 270 (West)**



2021



2013
Photo Point 1.2: View of north streambank looking downstream. **Compass: 45 (Northeast)**



2021



2013
Photo Point 1.3: View of south streambank. **Compass: 90 (East)**



2021

PHOTO INFORMATION

PROJECT NAME: North Fork Bear Creek Stream Mitigation Site

DATES: 2013 and 2021 Monitoring Events



2013
Photo Point 1.4: View of dry channel looking upstream. **Compass:** 230 (Southwest)



2021



2013
Photo Point 2.1: View of root wads on north bank. **Compass:** 225 (Southwest)



2021



2013
Photo Point 2.2: View across channel of south streambank. **Compass:** 180 (South)



2021

PHOTO INFORMATION

PROJECT NAME: North Fork Bear Creek Stream Mitigation Site

DATES: 2013 and 2021 Monitoring Events



2013



2021

Photo Point 2.3: View from north bank looking across channel. **Compass:** 135 (Southeast)



2013



2021

Photo Point 3.1: View downstream from north bridge abutment. **Compass:** 90 (East)



2013



2021

Photo Point 3.2: View of south streambank from left abutment. **Compass:** 135 (Southeast)

PHOTO INFORMATION

PROJECT NAME: North Fork Bear Creek Stream Mitigation Site

DATES: 2013 and 2021 Monitoring Events



2013



2021

Photo Point 3.3: View across channel of south bank from north bridge abutment. **Compass:** 180 (South)



2013



2021

Photo Point 4.1: View from south bank looking upstream from downstream extent. **Compass:** 270 (West)



2013



2021

Photo Point 4.2: View of root wads on north bank downstream of bridge. **Compass:** 0 (North)

PHOTO INFORMATION

PROJECT NAME: North Fork Bear Creek Stream Mitigation Site

DATES: 2020 and 2021 Monitoring Events



2020



2021

Additional Photo 1: Looking upstream at a flow path that formed under the Highway 93 Bridge during high flow events in 2020.

APPENDIX C

2013 – 2021 COMPREHENSIVE PLANT SPECIES LIST

MDT Streams Mitigation Monitoring
North Fork Bear Creek
Ravalli County, Montana

Table C-1. Comprehensive list of plant species observed at the North Fork Bear Creek Stream Mitigation Site from 2013 through 2021.

Scientific Name	Common Name	WMVC Indicator Status*	Duration
<i>Achillea millefolium</i>	Common Yarrow	FACU	P
<i>Agropyron cristatum</i>	Crested Wheatgrass	UPL	P
<i>Agrostis gigantea</i>	Black Bent	FAC	P
<i>Agrostis scabra</i>	Rough Bent	FAC	P
<i>Alopecurus aequalis</i>	Short-Awn Meadow-Foxtail	OBL	P
<i>Alnus incana</i>	Speckled Alder	FACW	P
<i>Alyssum alyssoides</i>	Pale Alyssum	UPL	A/B
<i>Amelanchier alnifolia</i>	Saskatoon Service-Berry	FACU	P
<i>Anaphalis margaritacea</i>	Pearly-Everlasting	FACU	P
<i>Antennaria parvifolia</i>	Nuttall's Pussytoes	UPL	P
<i>Aster</i> sp.	Aster	N/A	A/P
<i>Artemisia tridentata</i>	Big Sagebrush	UPL	P
<i>Bassia scoparia</i>	Mexican-Fireweed	FAC	A
<i>Berteroa incana</i>	Hoary False-Alyssum	UPL	A/B/P
<i>Bromus diandrus</i>	Ripgut Brome	UPL	A/P
<i>Bromus inermis</i>	Smooth Brome	UPL	P
<i>Bromus tectorum</i>	Cheatgrass	UPL	A
<i>Camelina microcarpa</i>	Little-Pod False Flax	FACU	A/B
<i>Carex bebbii</i>	Bebb's Sedge	OBL	P
<i>Carex nebrascensis</i>	Nebraska Sedge	OBL	P
<i>Carex</i> sp.	Sedge	N/A	P
<i>Carex stipata</i>	Stalk-Grain Sedge	OBL	P
<i>Centaurea stoebe</i>	Spotted Knapweed	UPL	B/P
<i>Cerastium arvense</i>	Field Mouse-Ear Chickweed	FACU	P
<i>Chamaenerion angustifolium</i>	Narrow-Leaf Fireweed	FACU	P
<i>Chenopodium album</i>	Lamb's-Quarters	FACU	A
<i>Cirsium arvense</i>	Canadian Thistle	FAC	P
<i>Cirsium vulgare</i>	Bull Thistle	FACU	B
<i>Cornus alba</i>	Red Osier	FACW	P
<i>Convolvulus arvensis</i>	Field Bindweed	UPL	P
<i>Coronilla varia</i>	Common Crown-Vetch	UPL	P
<i>Crataegus douglasii</i>	Black Hawthorn	FAC	P
<i>Crepis tectorum</i>	Narrowleaf Hawksbeard	UPL	A
<i>Cynoglossum officinale</i>	Gypsy-Flower	FACU	B
<i>Dactylis glomerata</i>	Orchard Grass	FACU	P
<i>Dasiphora fruticosa</i>	Golden-Hardhack	FAC	P
<i>Deschampsia caespitosa</i>	Tufted Hairgrass	FACW	P
<i>Dodecatheon pulchellum</i>	Dark-Throat Shootingstar	FACW	P
<i>Elymus canadensis</i>	Nodding Wild Rye	FAC	P
<i>Elymus glaucus</i>	Blue Wild Rye	FACU	P
<i>Elymus repens</i>	Creeping Wild Rye	FAC	P
<i>Elymus trachycaulus</i>	Slender Wild Rye	FAC	P
<i>Epilobium brachycarpum</i>	Panicled Willowherb	UPL	A
<i>Epilobium ciliatum</i>	Fringed Willowherb	FACW	P
<i>Erigeron compositus</i>	Cutleaf Fleabane	UPL	P
<i>Festuca idahoensis</i>	Bluebunch Fescue	FACU	P
<i>Galium aparine</i>	Sticky-Willy	FACU	A

Scientific Name	Common Name	WMVC Indicator Status*	Duration
<i>Galium boreale</i>	Northern Bedstraw	FACU	P
<i>Geranium viscosissimum</i>	Sticky Purple Crane's-Bill	FACU	P
<i>Geum macrophyllum</i>	Large-Leaf Avens	FAC	P
<i>Glyceria striata</i>	Fowl Manna Grass	OBL	P
<i>Hieracium umbellatum</i>	Narrowleaf Hawkweed	UPL	P
<i>Hordeum jubatum</i>	Fox-Tail Barley	FAC	P
<i>Hypericum perforatum</i>	Common St. John's-Wort	FACU	P
<i>Juncus balticus</i>	Baltic Rush	FACW	P
<i>Juncus effusus</i>	Lamp Rush	FACW	P
<i>Juncus sp.</i>	Rush	N/A	P
<i>Juncus tenuis</i>	Lesser Poverty Rush	FAC	P
<i>Lactuca serriola</i>	Prickly Lettuce	FACU	A/B
<i>Lepidium campestre</i>	Field Pepper-Grass	UPL	A/B
<i>Leucanthemum vulgare</i>	Ox-Eye Daisy	FACU	P
<i>Lycopus asper</i>	Rough Water-Horehound	OBL	P
<i>Medicago lupulina</i>	Black Medick	FACU	A/P
<i>Melilotus officinalis</i>	Yellow Sweet-Clover	FACU	A/B/P
<i>Mentha arvensis</i>	American Wild Mint	FACW	P
<i>Myosotis laxa</i>	Bay Forget-Me-Not	OBL	A/B/P
<i>Nasturtium officinale</i>	Watercress	OBL	P
<i>Osmorhiza occidentalis</i>	Sweet-cicely	UPL	P
<i>Pascopyrum smithii</i>	Western-Wheat Grass	FACU	P
<i>Penstemon procerus</i>	Pincushion Beardtongue	FAC	P
<i>Penstemon sp.</i>	Beardtongue	N/A	P
<i>Peritoma serrulata</i>	Rocky Mountain Beeplant	FACU	A
<i>Phalaris arundinacea</i>	Reed Canary Grass	FACW	P
<i>Phleum pratense</i>	Common Timothy	FAC	P
<i>Picea pungens</i>	Blue Spruce	FAC	P
<i>Pinus ponderosa</i>	Ponderosa Pine	FACU	P
<i>Poa compressa</i>	Flat-Stem Blue Grass	FACU	P
<i>Poa palustris</i>	Fowl Blue Grass	FAC	P
<i>Poa pratensis</i>	Kentucky Blue Grass	FAC	P
<i>Polygonum cuspidatum</i>	Japanese Knotweed	UPL	P
<i>Populus angustifolia</i>	Narrow-Leaf Cottonwood	FACW	P
<i>Populus balsamifera</i>	Balsam Poplar	FAC	P
<i>Potentilla anserina</i>	Silverweed	OBL	P
<i>Potentilla recta</i>	Sulphur Cinquefoil	UPL	P
<i>Prunella vulgaris</i>	Common Selfheal	FACU	P
<i>Prunus virginiana</i>	Choke Cherry	FACU	P
<i>Pseudoroegneria spicata</i>	Bluebunch Wheatgrass	UPL	P
<i>Pseudotsuga menziesii</i>	Douglas-Fir	FACU	P
<i>Ranunculus repens</i>	Creeping Buttercup	FAC	P
<i>Ranunculus sp.</i>	Buttercup	N/A	P
<i>Ribes lacustre</i>	Bristly Black Gooseberry	FAC	P
<i>Rosa woodsii</i>	Woods' Rose	FACU	P
<i>Rubus idaeus</i>	Common Red Raspberry	FACU	P
<i>Rubus sp.</i>	Raspberry sp.	N/A	P
<i>Rumex acetosa</i>	Garden Sorrel	FAC	P
<i>Rumex acetosella</i>	Common Sheep Sorrel	FACU	P

Scientific Name	Common Name	WMVC Indicator Status*	Duration
<i>Salix amygdaloides</i>	Peach-Leaf Willow	FACW	P
<i>Salix bebbiana</i>	Gray Willow	FACW	P
<i>Salix drummondiana</i>	Drummond's Willow	FACW	P
<i>Salix lasiandra</i>	Pacific Willow	FACW	P
<i>Salix sp.</i>	Willow	N/A	P
<i>Salsola tragus</i>	Prickly Russian-Thistle	FACU	A
<i>Scutellaria galericulata</i>	Hooded Skullcap	OBL	P
<i>Silene latifolia</i>	Bladder Campion	UPL	B/P
<i>Silene noctiflora</i>	Night-flowering Catchfly	UPL	A
<i>Sinapis arvensis</i>	Corn Mustard	UPL	A
<i>Sisymbrium altissimum</i>	Tall Hedge-Mustard	FACU	A/B
<i>Solanum dulcamara</i>	Climbing Nightshade	FAC	P
<i>Solidago canadensis</i>	Canadian Goldenrod	FACU	P
<i>Sonchus arvensis</i>	Field Sow-Thistle	FACU	P
<i>Symphoricarpos albus</i>	Common Snowberry	FACU	P
<i>Symphoricarpos occidentalis</i>	Western Snowberry	FAC	P
<i>Symphyotrichum ascendens</i>	Western American-Aster	FACU	P
<i>Symphyotrichum laeve</i>	Smooth Blue American-Aster	FACU	P
<i>Tanacetum vulgare</i>	Common Tansy	FACU	P
<i>Taraxacum officinale</i>	Common Dandelion	FACU	P
<i>Thalictrum dasycarpum</i>	Purple Meadow-Rue	FACW	P
<i>Thlaspi arvense</i>	Field Pennycress	UPL	A
<i>Tragopogon dubius</i>	Meadow Goat's-beard	UPL	A/B
<i>Trifolium pratense</i>	Red Clover	FACU	B/P
<i>Trifolium repens</i>	White Clover	FAC	P
<i>Verbascum thapsus</i>	Great Mullein	FACU	B
<i>Veronica americana</i>	American-Brooklime	OBL	P

* 2018 National Wetland Plant List; Western Mountains, Valleys, and Coast Region (WMVC) (USACE 2018)

Duration: A=Annual; B=Biennial; P=Perennial; USDA PLANTS Database (2021)

Species identified to genus level have been assigned an indicator status of N/A