

Montana Department of Transportation Stream Mitigation Monitoring Report
BOWSER CREEK MITIGATION SITE

Project Overview

MDT Project Number: NH-MT5-3(50)109F UPN #: 2038013

Watershed: Watershed #4 - Flathead

Monitoring Year: 2021

Years Monitored: 9th year of monitoring

Corps Permit Number: NWO-2009-018098-MTM

Monitoring Conducted By: Confluence Consulting Inc.

Monitoring Dates: August 11, 2021

Purpose of the approved project:

The purpose of this project was to provide on-site compensatory mitigation for impacts to Bowser Creek from a highway widening project along the U.S. Highway 2 Kalispell Bypass. As a part of the project, Montana Department of Transportation (MDT) impacted a 709-foot segment of Bowser Creek to move it farther from the roadway and right-of way. The project was constructed in 2010 and involved relocating 430 linear feet of channel slightly to the north of its previous location, laying back floodplain slopes adjacent to the channel from 1.5:1 to a 4:1 slope (or flatter) and implementing an aggressive revegetation plan to re-establish native riparian and upland vegetation.

Site Location:

Upstream Coordinates: 48.1971988607, -114.341118964

Downstream Coordinates: 48.1972550009, -114.342793899

County: Flathead **Nearest Town:** Kalispell

Map Included: Figure 1 on page # 7.

Mitigation Site Construction Started: 2010 **Construction Ended:** 2010

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

Activity: Herbicide application for noxious weeds **Date:** Spring 2021

Specific recommendations for additional corrective actions: Plant additional woody vegetation along the stream bank and within the riparian corridor to improve woody cover.

Previous Monitoring Reports and Methods Descriptions:

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

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

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

Performance Standards:

Results from the 2021 monitoring event indicate the Bowser Creek stream mitigation site is meeting five of the six quantitative performance standards established in the monitoring plan

(Table 1). Ten years post-construction, the site exhibits 79% non-noxious vegetative cover and noxious weeds comprise 3% of the vegetative cover within the riparian buffer. Combined aerial cover of riparian and stream bank vegetation is 85% and reed canary grass (*Phalaris arundinacea*) was the dominant vegetation community, with an associated Winward stability rating of 9. The stream banks are stable, and the channel form is being maintained. Planted trees and shrub survival, documented at 32%, was the only performance standard that did not meet the success criteria of $\geq 50\%$ survival.

Table 1. Summary of Performance Standards.

Performance Standards	Success Criteria	Criteria Achieved Y/N	Discussion
Riparian Buffer Success	a. Areas within creditable riparian buffer disturbed during construction must have 50% or greater aerial cover of non-noxious weed species by the end of the monitoring period	Y	Vegetation transects indicate 79% cover of the riparian zones with non-noxious weed species.
	b. Noxious weeds do not exceed 10% cover within the riparian buffer areas.	Y	Vegetation transects indicate 3% cover of noxious weeds within riparian zones.
Vegetation Success	a. Combined aerial cover of riparian and stream bank vegetation communities is at least 70%	Y	Combined aerial cover of riparian and stream bank vegetation is 85%
	b. Planted trees and shrubs must exhibit 50% survival after 5 years.	N	Planted tree and shrub survival documented at 32%.
Vegetation along Stream Banks	Majority of the stream bank must be vegetated by plants with a root stability index of at least 6.	Y	Dominant streambank community along both stream banks is community Type 2- <i>Phalaris arundinacea</i> , with a root stability index of 9.
Stream Bank Stability	Less than 25% of bank length is unstable and classified as eroding bank.	Y	One actively eroding bank, representing 1.5% of the total bank length was observed in 2021.
Channel Form (Qualitative)	Stream has stabilized, includes pools and riffles, is able to occupy the floodplain during flood events, and riparian plant communities have successfully established along the streambanks.	Y	Channel form is relatively stable, the stream contains pool-riffle sequences, is able to access the floodplain, and riparian plant communities are well established along the streambanks.

Additional Reporting Requirements:

1. **Photo Documenting** success of restored stream channel and stream bank vegetation community development showing distinct positive changes from pre-construction to final monitoring year in comparison with the establishment reference reach.

Summary Data

Riparian and Stream Bank Vegetation Inventory

In 2021, average cover values for riparian and stream bank vegetation transects were 85% total cover, 5% woody species cover and 3% noxious weed cover (Table 2). Total cover values are calculated using an area-weighted average of the riparian and streambank transects. The total percent cover within riparian transects was 82%, which included 5% cover by woody species and 3% by noxious weeds. Stream bank transects exhibited 94% total cover, and included 4% woody species cover and 3% noxious weed cover. More bare ground was observed within riparian areas (18%), as compared to stream bank areas (6%), particularly in areas previously dominated by noxious weeds.

Since 2013, 109 plant species have been identified within the project area, including two species observed for the first time in 2021 (Appendix C). One native hydrophytic species, northern water-plaintain (*Alisma triviale*), was identified for the first time in 2021, as was Rocky Mountain beeplant (*Peritoma serrulata*). Rocky Mountain beeplant is a native upland species often used in MDT revegetation seed mixes along highway projects. In 2021, 51% of the species observed were hydrophytic based on the 2018 National Wetland Plant List (USACE, 2018).

Table 2. Vegetation cover estimates at the Bowser Creek Stream Mitigation Site in 2013, and 2019 through 2021.

Belt Transect	Length (ft)	Total % Vegetation Cover				% Woody Cover				% Noxious Weed Cover			
		2013	2019	2020	2021	2013	2019	2020	2021	2013	2019	2020	2021
Right (South) Riparian ^a	204	100	85	82	80	2	6	6	6	2	3	2	2
Left (North) Riparian ^a	167	100	90	87	84	14	10	7	6	5	5	2	3
Riparian Subtotal		100	87	84	82	8	8	7	6	4	4	2	3
Right (South) Stream Bank ^b	465	100	98	95	93	17	4	4	4	4	2	2	2
Left (North) Stream Bank ^b	465	100	98	95	95	12	5	3	3	4	2	2	3
Stream Bank Subtotal		100	98	95	94	15	5	4	4	4	2	2	3
Area Weighted Total		100	90	87	85	9	7	6	5	3	4	2	3

^a Riparian belt transects are 25' wide

^b Stream bank transects are 3' wide

The stream bank vegetation inventory identified a total of 53 plant species along the banks of Bowser Creek (Appendix D). However, reed canary grass dominated the stream bank community and comprised 21-50% of the cover in 2021. Winward stability ratings are typically assigned based on the stability ratings of multiple dominant species within a vegetation community rather than individual species, however since *Phalaris arundinacea* was the only dominant species within the streambank transects, the Winward stability rating was based solely on this species, which has a stability rating of 9 (Winward 2000).

Dominant species recorded along the riparian and stream bank transects were combined with visual observations throughout the site to develop a vegetation community map (Figure 3, Appendix A). The four vegetation community types observed in 2021 are described below (Table 3).

Table 3. Vegetation community types observed at Bowser Creek in 2021.

Community Type	Dominant Species
2	<i>Phalaris arundinacea</i>
3	<i>Nasturtium officinale</i>
5	<i>Elymus spp./ Festuca ovina</i>
6	<i>Elymus spp./ Bromus inermis</i>

Vegetation community Type 2 – *Phalaris arundinacea* was identified along both stream banks and riparian zones adjacent to the channel. Reed canary grass dominated this community, with lesser cover provided by field horsetail (*Equisetum arvense*), creeping meadow-foxtail (*Alopecurus arundinaceus*), Northwest Territory sedge (*Carex utriculata*), creeping wild rye (*Elymus repens*), Nebraska sedge (*Carex nebrascensis*), watercress (*Nasturtium officinale*), and other species. Community Type 2 was the dominant community type observed along the stream banks.

Vegetation community Type 3 – *Nasturtium officinale* was observed within the channel. Watercress dominated this community type with more than 50% cover growing in the channel bed and 6 to 10% cover along both stream banks. This community has been consistently observed in dense stands along the stream bed and edges of stream banks during the growing season since the 2015 monitoring event.

Vegetation community Type 5 – *Elymus spp./Festuca ovina* was identified along the upper slopes of the southern and eastern portions of the project area. Sheep fescue (*Festuca ovina*), nodding wild rye (*Elymus canadensis*), slender wild rye (*Elymus trachycaulus*), and western-wheat grass (*Pascopyrum smithii*) were the most common species within this vegetation community.

Vegetation community Type 6 – *Elymus spp./Bromus inermis* was observed for the first time in 2019 due to a shift in dominance from the noxious Canada thistle (*Cirsium arvense*) and nonnative bull thistle (*Cirsium vulgare*) to patchily distributed bare ground and an increase in the nonnative smooth brome (*Bromus inermis*).

Noxious Weed Inventory

A total of seven Priority 2B noxious weeds were identified within the Bowser Creek stream mitigation site and included spotted knapweed (*Centaurea stoebe*), Canada thistle (*Cirsium arvense*), houndstongue (*Cynoglossum officinale*), St. Johnswort (*Hypericum perforatum*), oxeye daisy (*Leucanthemum vulgare*), yellow toadflax (*Linaria vulgaris*), and common tansy (*Tanacetum vulgare*) (MT Department of Agriculture, 2019). Locations of noxious weed infestations are provided on Figure 3 in Appendix A, with the exception of those observed as

isolated occurrences and those in trace amounts, which include spotted knapweed, St. Johnswort, common tansy, houndstongue, and oxeye daisy. A low cover class (1 to 5 percent) was assigned to all mapped weed occurrences within the project area. In 2021, a visual estimate of 3% of the project area was colonized by noxious weeds, representing an increase of 1% since the 2020 monitoring event. Infestations of Canada thistle, the most prevalent noxious weed, were located throughout the project area, although in far lesser amounts than observed in previous monitoring inspections.

Woody Plant Survival

Willows (*Salix* spp.), speckled alder (*Alnus incana*), red osier dogwood (*Cornus alba*), common snowberry (*Symphoricarpos albus*), chokecherry (*Prunus virginiana*), bog birch (*Betula pumila*), and Woods' rose (*Rosa woodsii*) were observed as planted woody species. In 2021, 188 planted trees and shrubs were identified, and 160 of those observed were alive (Table 4). It is unknown how many plants were installed during construction of the project; however, the revegetation plan called for planting 505 trees and shrubs. As compared to the revegetation plan, 32% (160 of 505) have survived 11 years following construction. While a few of the surviving shrubs have grown 4-5 feet tall, most shrubs remain small, with many exhibiting poor vigor and do not substantially contribute to the site's woody cover. Overall, the project area exhibits less than 10% areal cover by woody species.

Table 4. Woody plant survival at Bowser Creek stream mitigation site 2013-2021.

Year	Total Plants Inspected	Surviving Plants	# of Woody Plantings in Design	Woody plant survival based on planting plan
2013	127	122	505	24%
2014	127	119		24%
2015	312	279		55%
2016	181	143		28%
2017	188	147		29%
2018	190	176		35%
2019	287	271		54%
2020	224	190		38%
2021	188	160		32%

Bank Erosion Inventory

One 22' long eroding bank was observed at Bowser Creek in 2021. This eroding bank is just downstream of the confluence of the outflow from a stormwater detention pond which is upgradient of the creek. Increased scour just below the outlet culvert indicates that discharges from this outlet may have been higher or more frequent in the last year, which could have exerted additional erosive forces on the bank below the confluence with Bowser Creek (Additional Photo 4, Appendix B). The severity of this erosion is low as it consists of minor sloughing and is not threatening the overall stability of the site or any infrastructure.

Channel Form

The cross-sections (i.e. transects) of Bowser Creek surveyed 2021 indicate that channel dimensions have remained relatively stable throughout the monitoring period (Appendix E). The bankfull channel width has remained quite consistent through the monitoring period, with the exception of Transect #3, where the channel has become wider and shallower by almost one foot since 2019 (Table 6). As no bank erosion was observed at this location, the observed channel widening is not considered to be problematic and may be due to survey discrepancies or natural channel adjustments.

The longitudinal profile indicates that three pool and riffle sequences have been maintained since 2014 (Appendix E). Pool width and depth has not been maintained in all cases and riffle elevations have adjusted up and down over the years. The pools located at Transect #1 and between stations 1+52 and 2+10 have partially filled, and the pool located at Transect #3 has filled in by approximately one foot (Table 5 & 6). The change in pool dimensions observed within the project reach are the result of sediment inputs either from upstream sources or as a result of channel widening, though cross-sectional data do not indicate that the latter is occurring.

Table 5. Maximum depths at four channel cross-section transects from 2013-2021.

Transect	Type	Max Depth (ft)								
		2013	2014	2015	2016	2017	2018	2019	2020	2021
1	Pool	1.9	1.9	1.5	1.7	1.7	1.8	1.8	2.0	1.9
2	Riffle	2.2	2.2	1.9	2	1.9	2.1	2.0	2.0	2.0
3	Pool	3.6	3.9	3.6	3.5	3.0	3.1	3.3	2.5	2.5
4	Riffle	1.9	2	1.7	1.9	1.9	2.1	2.1	1.8	2.1
Average Riffles		2.1	2.1	1.8	2.0	1.9	2.1	2.1	1.9	2.1
Average Pools		2.8	2.9	2.6	2.6	2.4	2.5	2.6	2.3	2.2
Average All		2.4	2.5	2.2	2.3	2.1	2.3	2.3	2.1	2.1

Table 6. Bankfull widths at four channel cross-section transects from 2013-2021.

Transect	Type	Bankfull Width (ft)								
		2013	2014	2015	2016	2017	2018	2019	2020	2021
1	Pool	6.0	6.1	5.0	6.0	6.3	6.4	5.9	6.0	6.5
2	Riffle	12.7	13.5	12.5	11.8	12.8	13.1	12.6	12.4	12.9
3	Pool	14.8	13.8	13.6	13.8	13.5	13.7	13.6	14.5	15.2
4	Riffle	7.8	8.1	7.6	7.5	7.5	7.3	7.3	7.6	7.6
Average Riffles		10.3	10.8	10.1	9.7	10.2	10.2	10.0	10.0	10.3
Average Pools		10.4	10.0	9.3	9.9	9.9	10.1	9.8	10.2	10.9
Average All		10.3	10.4	9.7	9.8	10.0	10.1	9.9	10.1	10.6

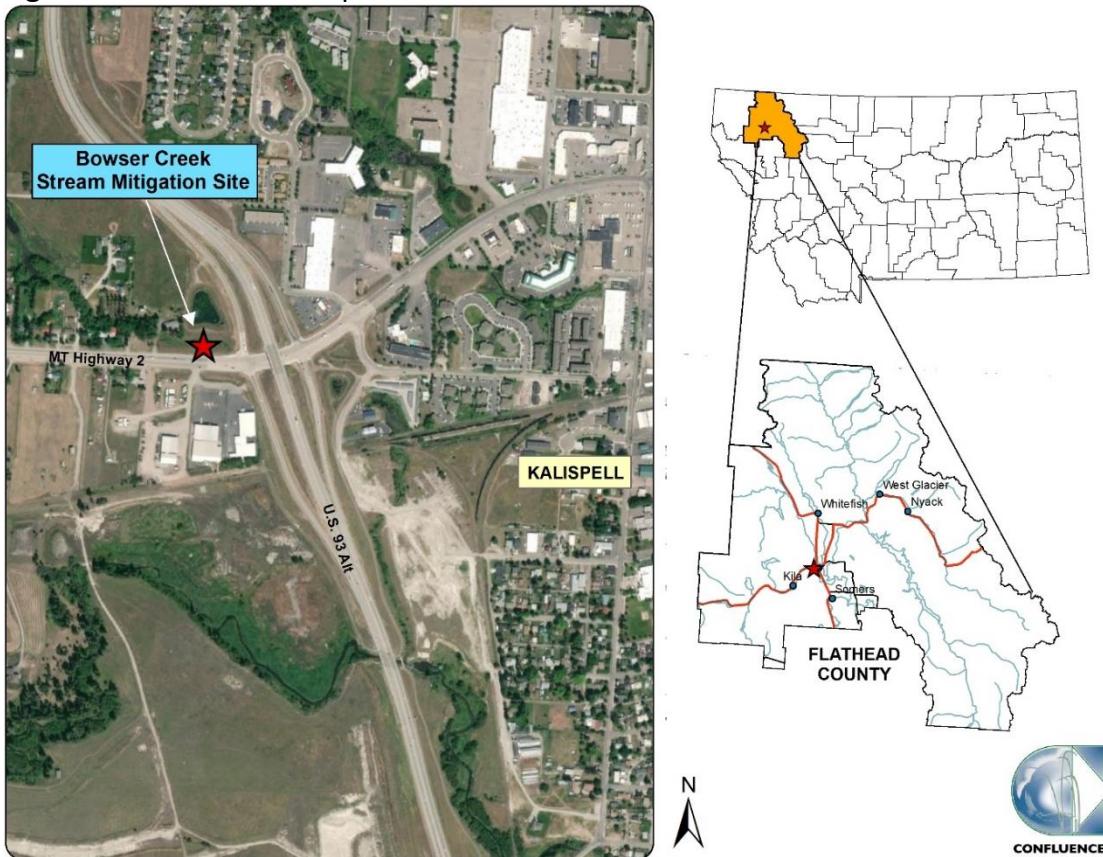
Conclusions

After nine years of monitoring, the Bowser Creek stream mitigation site is meeting all performance standards except for the percent survival of planted trees and shrubs. MDT will be coordinating with the USACE to discuss performance standards and future monitoring of this

site. Inspections of the stormwater outflow may be warranted to ensure that this feature does not become problematic for the outlet or impoundment structure.

Maps, Plans, Photos:

Figure 1. Site Location Map



Project Area Maps/Figures: See Appendix A.

Photos: See Appendix B.

Comprehensive Plant List: See Appendix C.

Stream Bank Vegetation Composition: See Appendix D.

Perpendicular Transect and Longitudinal Profile Plots: See Appendix E.

Plans: See Appendix E of 2013 Monitoring Report.

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

References

Montana Department of Agriculture (MDA). 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. 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

Winward, Alma H. 2000. *Monitoring the Vegetation Resources in Riparian Areas.* Gen. Tech. Rep. RMRS-GTR-47. Ogden, UT: U.S. Department of Agriculture, Forest Service, Rocky Mountain Research Station.

APPENDIX A
PROJECT AREA MAPS

MDT Streams Mitigation Monitoring
Bowser Creek
Flathead County, Montana



Legend

- Photo Points
- 2014 Channel Center
- Major Station (100')
- Minor Station (25')
- 2021 Channel Thalweg
- Eroding Banks
- Pool and Riffle Transects
- Riparian Transects

0 25 50 100
Feet

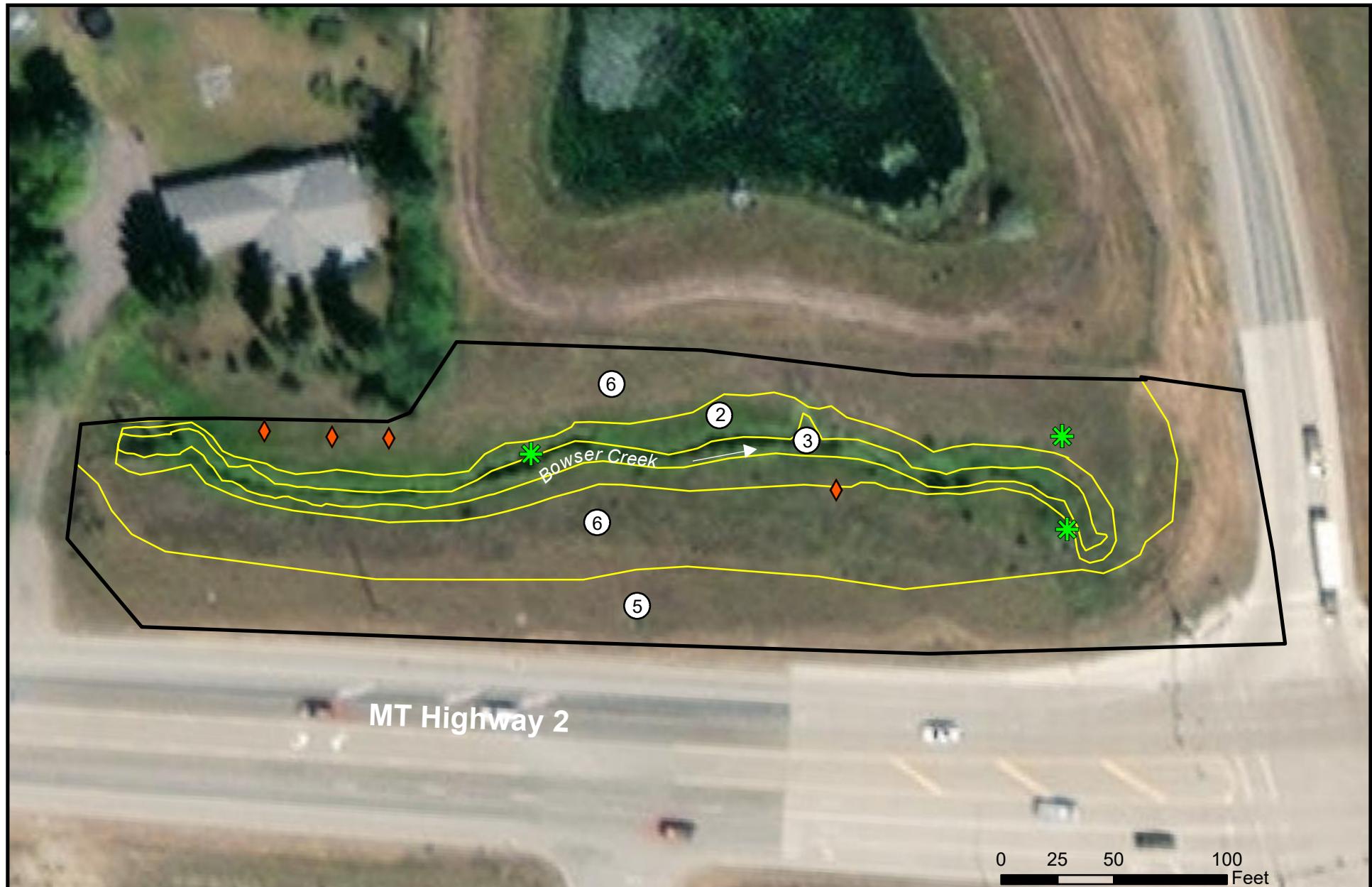


Bowser Creek - 2021 Monitoring Features

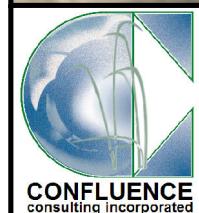
Figure 2

Date: 1/6/2022

Bowser_features2021.mxd



0 25 50 100
Feet



Legend

— Project Boundary

◆ Cirsium arvense

— Vegetation
Community
Boundary

* Linaria vulgaris

- ② Phalaris Community
- ③ Nasturtium Community
- ⑤ Elymus/Festuca Community
- ⑥ Elymus/Bromus Community

N

**Bowser Creek - 2021
Noxious Weeds and
Vegetation Community**
Figure 3
Date: 2/14/2022
Bowser_monitor2021.mxd

APPENDIX B
PROJECT AREA PHOTOGRAPHS

MDT Streams Mitigation Monitoring
Bowser Creek
Flathead County, Montana

MONITORING PHOTO LOG

SITE NAME: Bowser Creek

MONITORING YEARS: 2013 and 2021



2013



2021

Photo 1: View looking west (upstream) of Bowser Creek.



2013



2021

Photo 2.1: View looking northwest at Bowser Creek.



2013



2021

Photo 2.2: View across Bowser Creek looking north from photo point 2.

MONITORING PHOTO LOG

SITE NAME: Bowser Creek

MONITORING YEAR: 2021



2013



2021

Photo 2.3: View looking east (downstream) of Bowser Creek from photo point 2.



2013



2021

Photo 2.4: View looking east across Bowser Creek from photo point 2.



2013



2021

Photo 3: View looking east (downstream) of Bowser Creek from photo point 3.

MONITORING PHOTO LOG

SITE NAME: Bowser Creek
MONITORING YEAR: 2021



2013



2021

Additional Photo 1: Prolific watercress growth shown in 2013 was less prevalent in 2021.



2013



2021

Additional Photo 2: Eroding bank EBL3.



2013



2021

Additional Photo 3: Widened channel segment.

MONITORING PHOTO LOG

SITE NAME: Bowser Creek

MONITORING YEAR: 2021



Additional Photo 4: Stormwater pond culvert and outflow confluence with Bowser Creek in August 2021.

SURVEY PHOTO LOG

SITE NAME: Bowser Creek
MONITORING YEAR: 2021



Survey Photo 1: T1 Left looking southwest to T1 Right.



Survey Photo 2: T1 Right looking northeast to T1 Left.



Survey Photo 3: T1 Left looking west upstream.



Survey Photo 4: T1 Left looking south downstream.



Survey Photo 5: T1 looking west upstream from middle of creek.



Survey Photo 6: T1 looking east downstream from middle creek.

SURVEY PHOTO LOG

SITE NAME: Bowser Creek
MONITORING YEAR: 2021



Survey Photo 7: T1 Right looking west upstream.



Survey Photo 8: T1 Right looking east downstream.



Survey Photo 9: T2 Left looking south to T2 Right.

Photo not taken in 2021

Survey Photo 10: T2 Right looking north to T2 Left.



Survey Photo 11: T2 Left looking west upstream.



Survey Photo 12: T2 Left looking southeast downstream.

SURVEY PHOTO LOG

SITE NAME: Bowser Creek
MONITORING YEAR: 2021



Survey Photo 13: T2 looking west upstream from middle of creek.



Survey Photo 14: T2 looking east downstream from middle of creek.



Survey Photo 15: T2 Right looking west upstream.



Survey Photo 16: T2 Right looking east downstream.



Survey Photo 17: T3 Left looking south to T3 Right.



Survey Photo 18: T3 Right looking north to T3 Left.

SURVEY PHOTO LOG

SITE NAME: Bowser Creek
MONITORING YEAR: 2021



Survey Photo 19: T3 Left looking west upstream.



Survey Photo 20: T3 Left looking east downstream.



Survey Photo 21: T3 looking west upstream from middle of creek.



Survey Photo 22: T3 looking east downstream from middle of creek.



Survey Photo 23: T3 Right looking west upstream.



Survey Photo 24: T3 Right looking east downstream.

SURVEY PHOTO LOG

SITE NAME: Bowser Creek
MONITORING YEAR: 2021



Survey Photo 25: T4 Left looking south to T4 Right.



Survey Photo 26: T4 Right looking north to T4 Left.



Survey Photo 27: T4 Left looking west upstream.



Survey Photo 28: T4 Left looking east downstream.



Survey Photo 29: T4 looking west upstream from middle of creek.



Survey Photo 30: T4 looking east downstream from middle of creek.

SURVEY PHOTO LOG

SITE NAME: Bowser Creek
MONITORING YEAR: 2021



Survey Photo 31: T4 Right looking west upstream.



Survey Photo 32: T4 Right looking east downstream.

APPENDIX C

2013 – 2021 COMPREHENSIVE PLANT SPECIES LIST

MDT Streams Mitigation Monitoring
Bowser Creek
Flathead County, Montana

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

Scientific Name	Common Name	WMVC Indicator Status*
<i>Achillea millefolium</i>	Common Yarrow	FACU
<i>Acer negundo</i>	Ash-Leaf Maple	FAC
<i>Agastache urticifolia</i>	Nettle-Leaf Giant-Hyssop	FACU
<i>Agropyron cristatum</i>	Crested Wheatgrass	UPL
<i>Agrostis gigantea</i>	Black Bent	FAC
<i>Agrostis stolonifera</i>	Spreading Bent	FAC
<i>Alisma triviale</i>	Northern Water-Plaintain	OBL
<i>Alopecurus arundinaceus</i>	Creeping Meadow-Foxtail	FAC
<i>Amelanchier alnifolia</i>	Saskatoon Service-Berry	FACU
<i>Artemisia absinthium</i>	Absinthium	UPL
<i>Artemisia biennis</i>	Biennial Wormwood	FACW
<i>Atriplex patula</i>	Halberd-Leaf Orache	FACW
<i>Beckmannia syzigachne</i>	American Slough Grass	OBL
<i>Betula pumila</i>	Bog Birch	OBL
<i>Bromus inermis</i>	Smooth Brome	UPL
<i>Calamagrostis canadensis</i>	Bluejoint Reedgrass	FACW
<i>Carduus acanthoides</i>	Spiny Plumeless Thistle	UPL
<i>Carduus nutans</i>	Nodding Plumeless-Thistle	UPL
<i>Carex bebbii</i>	Bebb's Sedge	OBL
<i>Carex nebrascensis</i>	Nebraska Sedge	OBL
<i>Carex pellita</i>	Woolly Sedge	OBL
<i>Carex sp.</i>	Sedge	N/A
<i>Carex stipata</i>	Stalk-Grain Sedge	OBL
<i>Carex utriculata</i>	Northwest Territory Sedge	OBL
<i>Centaurea cyanus</i>	Garden Cornflower	FACU
<i>Centaurea stoebe</i>	Spotted Knapweed	UPL
<i>Chamaenerion angustifolium</i>	Narrow-Leaf Fireweed	FACU
<i>Chenopodium album</i>	Lamb's-Quarters	FACU
<i>Chorispora tenella</i>	Common Blue-Mustard	UPL
<i>Cicuta douglasii</i>	Western Water-Hemlock	OBL
<i>Cirsium arvense</i>	Canadian Thistle	FAC
<i>Cirsium vulgare</i>	Bull Thistle	FACU
<i>Cornus alba</i>	Red Osier	FACW
<i>Cynoglossum officinale</i>	Gypsy-Flower	FACU
<i>Descurainia sophia</i>	Herb Sophia	UPL
<i>Elymus canadensis</i>	Nodding Wild Rye	FAC
<i>Elymus repens</i>	Creeping Wild Rye	FAC
<i>Elymus trachycaulus</i>	Slender Wild Rye	FAC
<i>Epilobium ciliatum</i>	Fringed Willowherb	FACW

Scientific Name	Common Name	WMVC Indicator Status*
<i>Equisetum arvense</i>	Field Horsetail	FAC
<i>Festuca ovina</i>	Sheep Fescue	UPL
<i>Galium aparine</i>	Sticky-Willy	FACU
<i>Geum macrophyllum</i>	Large-Leaf Avens	FAC
<i>Geum sp.</i>	Avens	N/A
<i>Geum triflorum</i>	Old-Man's-Whiskers	FACU
<i>Glyceria grandis</i>	American Manna Grass	OBL
<i>Glyceria striata</i>	Fowl Manna Grass	OBL
<i>Helianthus maximiliani</i>	Maximilian Sunflower	UPL
<i>Helianthus nuttallii</i>	Nuttall's Sunflower	FACW
<i>Hordeum jubatum</i>	Fox-Tail Barley	FAC
<i>Hypericum perforatum</i>	Common St. John's-Wort	FACU
<i>Juncus balticus</i>	Baltic Rush	FACW
<i>Juncus sp.</i>	Rush	N/A
<i>Lactuca serriola</i>	Prickly Lettuce	FACU
<i>Lathyrus sylvestris</i>	Flat Pea	UPL
<i>Lemna minor</i>	Common Duckweed	OBL
<i>Leucanthemum vulgare</i>	Ox-Eye Daisy	FACU
<i>Leymus cinereus</i>	Great Basin Lyme Grass	FAC
<i>Linaria vulgaris</i>	Butter-and-Eggs	UPL
<i>Lysichiton americanus</i>	Yellow-Skunk-Cabbage	OBL
<i>Medicago lupulina</i>	Black Medick	FACU
<i>Medicago sativa</i>	Alfalfa	UPL
<i>Melilotus albus</i>	White Sweetclover	UPL
<i>Melilotus officinalis</i>	Yellow Sweet-Clover	FACU
<i>Mentha arvensis</i>	American Wild Mint	FACW
<i>Myosotis scorpioides</i>	True Forget-Me-Not	FACW
<i>Nasturtium officinale</i>	Watercress	OBL
<i>Nepeta cataria</i>	Catnip	FACU
<i>Onopordum acanthium</i>	Scotch Thistle	UPL
<i>Pascopyrum smithii</i>	Western-Wheat Grass	FACU
<i>Peritoma serrulata</i>	Rocky Mountain Beeplant	FACU
<i>Phalaris arundinacea</i>	Reed Canary Grass	FACW
<i>Phleum pratense</i>	Common Timothy	FAC
<i>Plantago lanceolata</i>	English Plantain	FACU
<i>Plantago major</i>	Great Plantain	FAC
<i>Poa palustris</i>	Fowl Blue Grass	FAC
<i>Poa pratensis</i>	Kentucky Blue Grass	FAC
<i>Prunus virginiana</i>	Choke Cherry	FACU
<i>Ranunculus sp.</i>	Buttercup	N/A
<i>Rosa woodsii</i>	Woods' Rose	FACU

Scientific Name	Common Name	WMVC Indicator Status*
<i>Rudbeckia hirta</i>	Black-Eyed-Susan	FACU
<i>Rumex crispus</i>	Curly Dock	FAC
<i>Salix bebbiana</i>	Gray Willow	FACW
<i>Salix drummondiana</i>	Drummond's Willow	FACW
<i>Salix exigua</i>	Narrow-Leaf Willow	FACW
<i>Salix sp.</i>	Willow	N/A
<i>Scirpus microcarpus</i>	Red-Tinge Bulrush	OBL
<i>Silene vulgaris</i>	Maiden's-tears	UPL
<i>Solanum dulcamara</i>	Climbing Nightshade	FAC
<i>Solidago canadensis</i>	Canadian Goldenrod	FACU
<i>Sonchus arvensis</i>	Field Sow-Thistle	FACU
<i>Stachys byzantina</i>	Woolly Hedgenettle	UPL
<i>Stuckenia pectinata</i>	Sago False Pondweed	OBL
<i>Symporicarpos albus</i>	Common Snowberry	FACU
<i>Tanacetum vulgare</i>	Common Tansy	FACU
<i>Taraxacum officinale</i>	Common Dandelion	FACU
<i>Thlaspi arvense</i>	Field Pennycress	UPL
<i>Tragopogon dubius</i>	Meadow Goat's-beard	UPL
<i>Trifolium pratense</i>	Red Clover	FACU
<i>Trifolium repens</i>	White Clover	FAC
<i>Triglochin maritima</i>	Seaside Arrow-Grass	OBL
<i>Typha angustifolia</i>	Narrow-Leaf Cat-Tail	OBL
<i>Typha latifolia</i>	Broad-Leaf Cat-Tail	OBL
<i>Urtica dioica</i>	Stinging Nettle	FAC
<i>Verbascum thapsus</i>	Great Mullein	FACU
<i>Veronica americana</i>	American Brooklime	OBL
<i>Vicia americana</i>	American Purple Vetch	FAC

* 2018 National Wetland Plant List; Western Mountains, Valleys, and Coast Region (USACE 2018). New species identified in 2021 are **bolded**. Species identified to genus level have been assigned an indicator status of N/A.

APPENDIX D

2021 STREAM BANK VEGETATION COMPOSITION

MDT Streams Mitigation Monitoring
Bowser Creek
Flathead County, Montana

Table D-1. Plant species and their associated cover classes along the stream banks of the Bowser Creek stream mitigation site in 2021. Percent Cover
Classes: 0 = <1%, 1 = 1-5%, 2 = 6-10%, 3 = 11-20%, 4 = 21-50%, 5 = >50%

Streambank Species	Left bank	Left Bank Cover Class	Right bank	Right Bank Cover Class	WMVC Indicator Status*
<i>Agrostis stolonifera</i>	X	1	X	1	FAC
<i>Alisma triviale</i>	X	0			OBL
<i>Alnus incana</i>			X	0	FACW
<i>Alopecurus arundinaceus</i>	X	2	X	2	FAC
<i>Artemisia absinthium</i>			X	0	UPL
<i>Bromus inermis</i>	X	1	X	1	UPL
<i>Calamagrostis canadensis</i>			X	0	FACW
<i>Carduus acanthoides</i>	X	0	X	0	UPL
<i>Carex bebbii</i>			X	0	OBL
<i>Carex nebrascensis</i>	X	2	X	1	OBL
<i>Carex pellita</i>	X	0			OBL
<i>Carex utriculata</i>	X	2	X	2	OBL
<i>Chamaenerion angustifolium</i>	X	0			FACU
<i>Cirsium arvense</i>	X	1	X	1	FAC
<i>Cirsium vulgare</i>	X	0	X	0	FACU
<i>Cornus alba</i>	X	0	X	0	FACW
<i>Cynoglossum officinale</i>	X	0	X	0	FACU
<i>Elymus repens</i>	X	2	X	1	FAC
<i>Epilobium ciliatum</i>	X	1	X	1	FACW
<i>Equisetum arvense</i>	X	3	X	3	FAC
<i>Galium aparine</i>	X	0			FACU
<i>Geum macrophyllum</i>			X	1	FAC
<i>Glyceria grandis</i>	X	0	X	0	OBL
<i>Helianthus maximiliani</i>	X	1	X	1	UPL
<i>Juncus balticus</i>	X	1			FACW
<i>Lactuca serriola</i>			X	0	FACU
<i>Leucanthemum vulgare</i>			X	0	FACU
<i>Linaria vulgaris</i>	X	0			UPL
<i>Medicago lupulina</i>	X	0	X	0	FACU
<i>Melilotus officinalis</i>			X	0	FACU
<i>Mentha arvensis</i>	X	0	X	1	FACW
<i>Myosotis scorpioides</i>	X	0			FACW
<i>Nasturtium officinale</i> ***	X	2	X	2	OBL
<i>Nepeta cataria</i>			X	0	FACU
<i>Persicaria amphibia</i>	X	0			OBL
<i>Phalaris arundinacea</i> **	X	4	X	4	FACW
<i>Poa palustris</i>	X	1	X	1	FAC

Streambank Species	Left bank	Left Bank Cover Class	Right bank	Right Bank Cover Class	WMVC Indicator Status*
<i>Poa pratensis</i>	X	1	X	2	FAC
<i>Rosa woodsii</i>	X	0			FACU
<i>Rumex crispus</i>	X	1	X	1	FAC
<i>Salix bebbiana</i>	X	1	X	0	FACW
<i>Salix drummondiana</i>	X	0	X	1	FACW
<i>Salix exigua</i>			X	1	FACW
<i>Scirpus microcarpus</i>	X	0			OBL
<i>Solanum dulcamara</i>	X	0	X	0	FAC
<i>Sonchus arvensis</i>	X	1	X	1	FACU
<i>Taraxacum officinale</i>	X	0	X	0	FACU
<i>Thlaspi arvense</i>	X	0			UPL
<i>Typha angustifolia</i>	X	0			FAC
<i>Typha latifolia</i>	X	1	X	1	OBL
<i>Verbascum thapsus</i>	X	0	X	0	FACU
<i>Veronica americana</i>	X	0	X	0	OBL
<i>Vicia americana</i>	X	0	X	0	FAC

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

** Dominant species observed along Bowser Creek stream banks

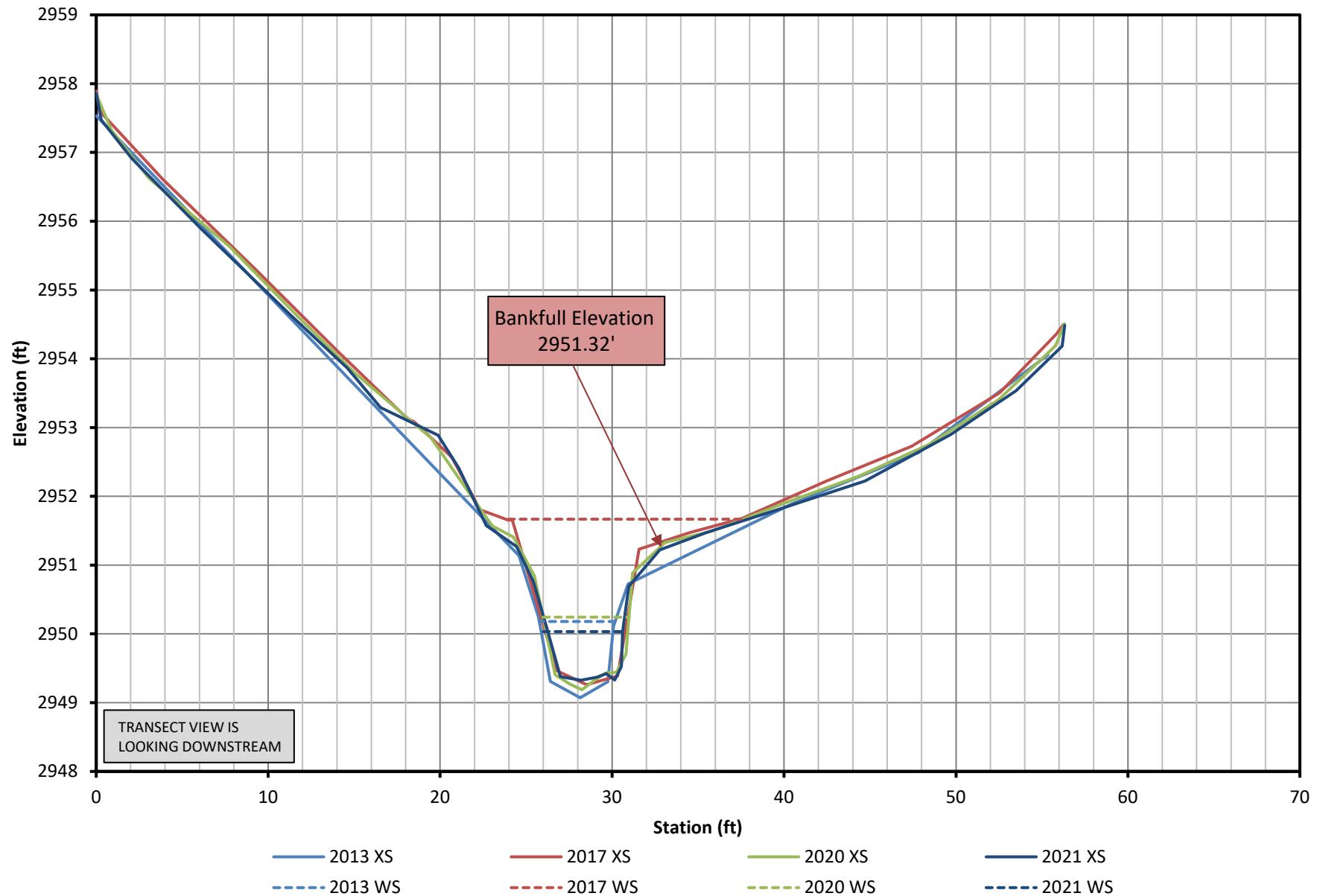
*** Dominant species observed along Bowser Creek stream bed

APPENDIX E

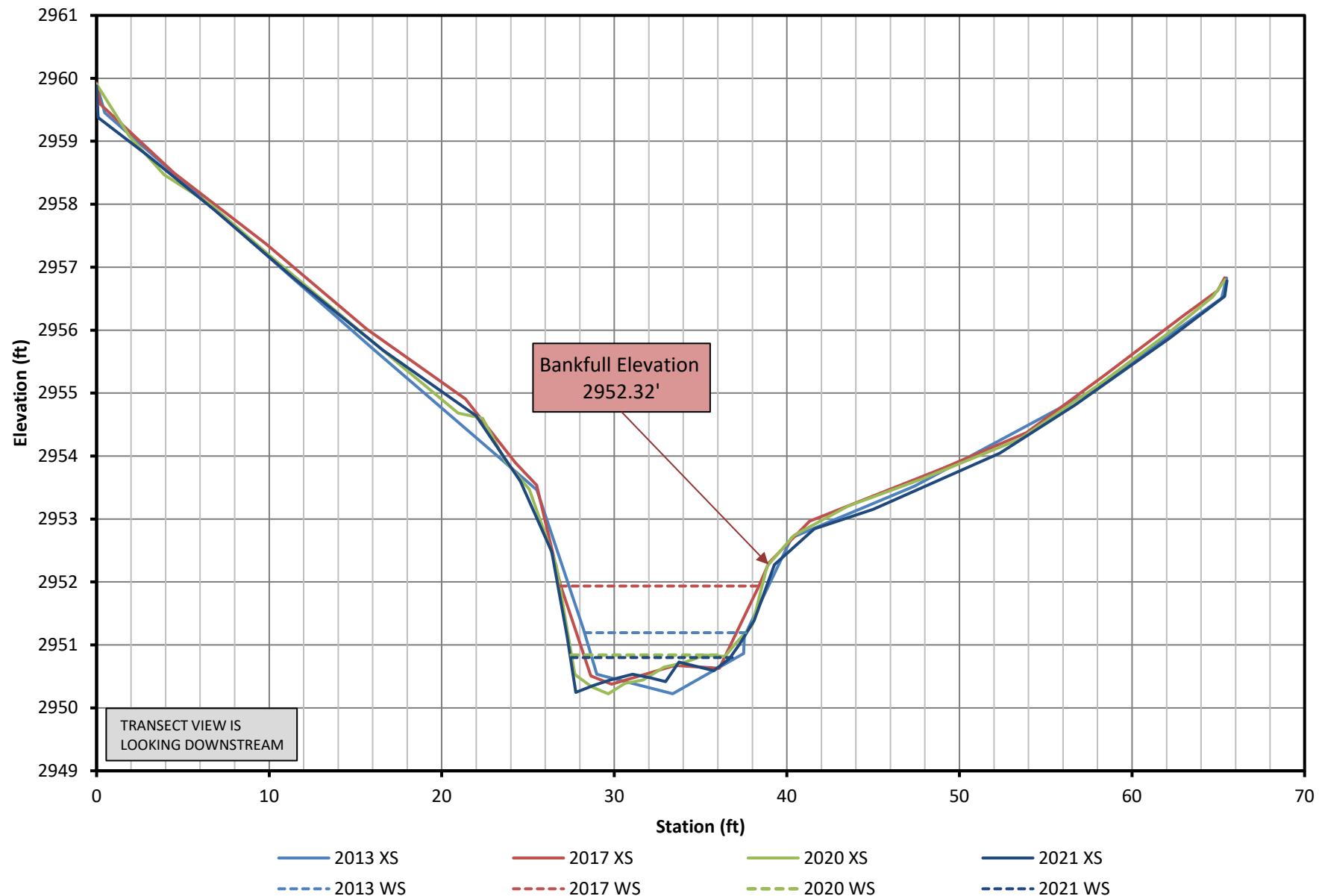
PERPENDICULAR TRANSECT PLOTS and LONGITUDINAL PROFILE

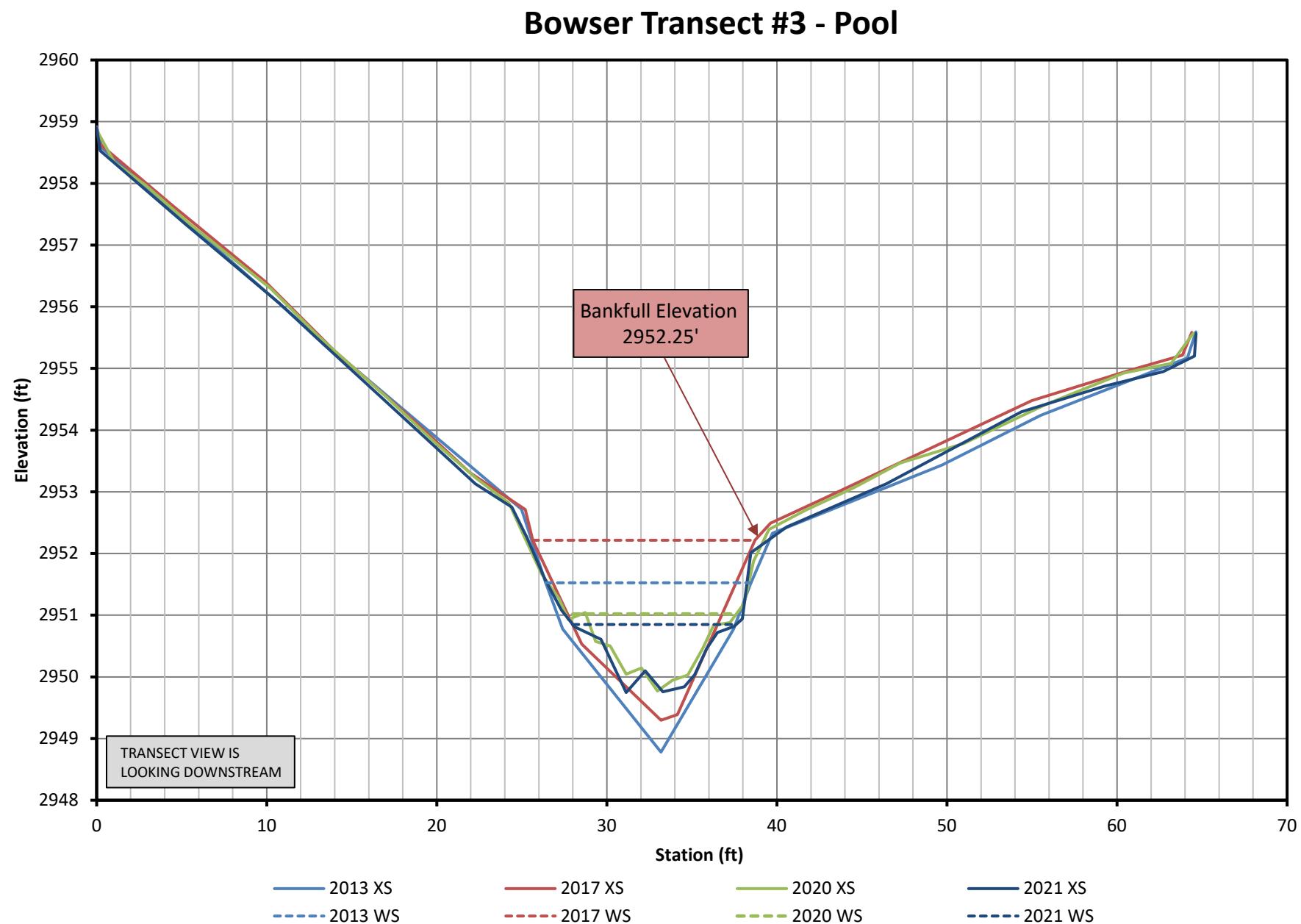
MDT Streams Mitigation Monitoring
Bowser Creek
Flathead County, Montana

Bowser Transect #1 - Pool

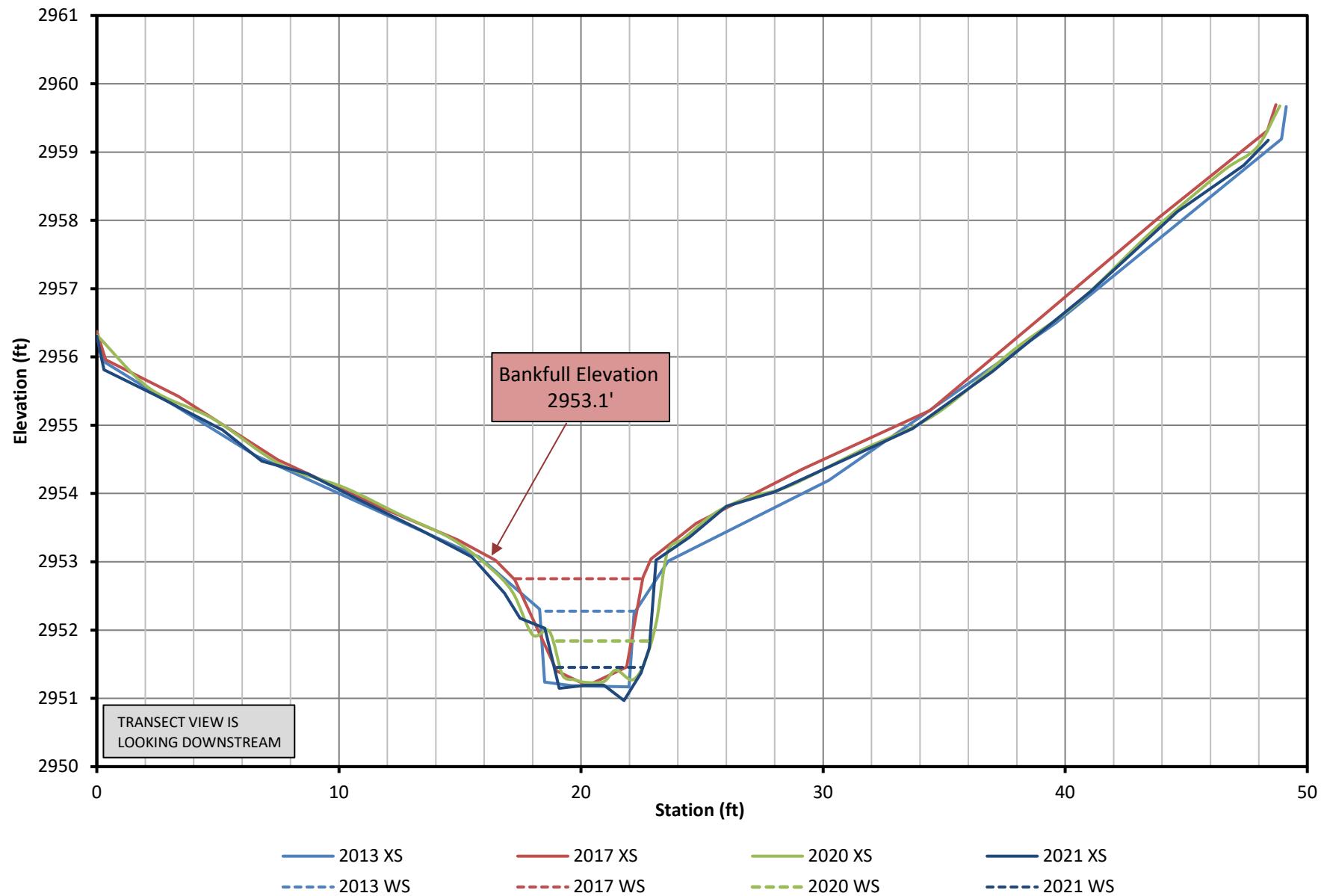


Bowser Transect #2 - Riffle





Bowser Transect #4 - Riffle



Bowser Creek Longitudinal Profiles

