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: 2022

Years Monitored: 10th year of monitoring

Corps Permit Number: NWO-2009-018098-MTM

Monitoring Conducted By: Confluence Consulting Inc.

Monitoring Dates: August 12, 2022

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: Investigate whether planting additional woody vegetation along the stream bank could improve woody cover or is the rate of volunteer woody vegetation establishment trending upward to meet this goal.

Previous Monitoring Reports and Methods Descriptions:

https://www.mdt.mt.gov/publications/brochures/stream-mitigation.aspx

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 2022 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). Twelve years post-construction, the site exhibits 80% 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 26%, was the only performance standard that did not meet the success criteria of ≥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-weed species by the end of the monitoring period	Y	Vegetation transects indicate riparian zones have 80% cover from non- weed species.
	b. Noxious weeds do not exceed 10% cover within the riparian buffer areas.	Y	Vegetation transects indicate 3% noxious weed cover within the 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 26%. Woody volunteers are establishing and provide additional streambank cover.
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- *Phalaris arundinacea*, with a root stability index of 9.
Stream Bank Stability	Less than 25% of bank length is unstable and classified as eroding bank.	Y	No eroding banks were observed in 2022.
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.	N	Channel planform is stable, but substantial sedimentation occurred between the 2021 and 2022 monitoring events, and pools were severely diminished. Riffle elevations were maintained. The stream is able to access the floodplain, and riparian plant communities are well established along the streambanks.

Additional Reporting Requirements:

1. **Photo Document** 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

Total cover values are calculated using an area-weighted average of the riparian and streambank transects (i.e the average accounts for the transects being of different lengths). In 2022, average areal cover values for riparian and stream bank vegetation transects were 85% total cover, 5% woody species cover, and 3% noxious weed cover (Table 2). 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 95% total cover, and included 4% woody species cover and 3% noxious weed cover, with most of the noxious weed cover along the north bank of Bowser Creek. More bare ground was observed within riparian transects as compared to the stream bank transects, especially in areas previously dominated by noxious weeds.

Table 2. Vegetation cover estimates at the Bowser Creek Stream Mitigation Site in 2013, and 2020 through 2022. Average values account for differences in belt transect area (i.e. area weighted).

Belt Transect	Length (ft)	Total % Vegetation Cover				% Woody Cover				% Noxious Weed Cover			
		2013	2020	2021	2022	2013	2020	2021	2022	2013	2020	2021	2022
Right (South) Riparian[a]	204	100	82	80	79	2	6	6	6	2	2	2	2
Left (North) Riparian[a]	167	100	87	84	85	14	7	6	6	5	2	3	3
Riparian Average		100	84	82	82	8	7	6	6	4	2	3	3
Right (South) Stream Bank[b]	465	100	95	93	94	17	4	4	3	4	2	2	3
Left (North) Stream Bank[b]	465	100	95	95	95	12	3	3	4	4	2	3	2
Stream Bank Average		100	95	94	94.5	15	4	4	4	4	2	3	3
Riparian and Stream Area Weighted Average		**100**	**87**	**85**	**85**	**9**	**6**	**5**	**5**	**3**	**2**	**3**	**3**

[a] Riparian belt transects are 25’ wide

[b] Stream bank transects are 3’ wide

Since 2013, 110 plant species have been identified within the entire project area (Appendix C). In 2022, one non-native, upland species was observed for the first time, mother-of-the-evening (*Hesperis matronalis*). The stream bank vegetation inventory identified a total of 52 plant species along the banks of Bowser Creek (Appendix D). Reed canary grass dominated the stream bank community and comprised 21-50% of the cover in 2022. 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 2022 are described below (

Table 3).

Table 3. Vegetation community types observed at Bowser Creek in 2022.

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

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* (watercress) 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 since the 2015 monitoring event. In 2022, this community appeared to be diversifying and now includes common duckweed (*Lemna minor)*, climbing nightshade (*Solanum dulcamara*), and true forget-me-not (*Myosotis scorpioides*), although in much lesser amounts than watercress.

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

Five Priority 2B noxious weeds were identified within the Bowser Creek stream mitigation site and included Canada thistle (*Cirsium arvense)*, houndstongue (*Cynoglossum officinale)*, oxeye

daisy (*Leucanthemum vulgare),* butter-and-eggs *(Linaria vulgaris),* and common tansy (*Tanacetum vulgare*) (MT Department of Agriculture, 2019). An estimated 3% of the project area was colonized by noxious weeds, representing a consistent level of infestation with 2021. A low cover class (1 to 5 percent) was assigned to all mapped weed occurrences within the project area in 2022. Canada thistle was the most prevalent noxious weed,with infestations located throughout the project area. Two infestations of butter-and-eggs previously mapped at the east end of the site were not observed in 2022, and two new infestations of oxeye daisy were recorded along the right bank of Bowser Creek. Locations of noxious weed infestations are provided on Figure 3 in Appendix A, with the exception of which include common tansy and houndstongue which were observed as isolated occurrences and in trace amounts.

Woody Plant Survival

Planted woody species observed included: 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*). A total of 148 planted trees and shrubs were identified in 2022, and 132 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, 26% (132 of 505) have survived 12 years following construction. While a few of the surviving shrubs have grown 4-5 feet tall, most shrubs remain small, with several exhibiting poor vigor.

Table 4. Woody plant survival at Bowser Creek stream mitigation site 2013-2022.

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
2022	148	132		26

Bank Erosion Inventory

No eroding banks were observed within the Bowser Creek site in 2022. Only one eroding bank was observed in 2021, and in 2022 this bank had developed enough vegetation cover to no longer be considered eroding.

Channel Form

The cross-sections (i.e. transects) of Bowser Creek surveyed in 2022 indicate that channel widths have remained stable since 2021 and did not show signs of lateral migration (Table 6).

Cross section data indicate the channel depths decreased slightly at three of the four cross-section locations since 2021. The 2022 longitudinal profile indicates an increased sediment load within the project reach since 2021. All three pools, which were maintained from 2014 to 2021, were largely filled-in during the 2022 monitoring event (Table 5; Appendix E). The decreased channel depths observed within the project reach are likely the result of upstream sediment inputs as no sediment sources are evident within the project reach. However, the longitudinal profile also indicates that the riffle elevations are being maintained, signifying that the reach as a whole is not aggrading (Appendix E).

Table 5. Maximum depths at four channel cross-section transects from 2013-2022.

Transect	Type	Max Depth (ft)									
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
1	Pool	1.9	1.9	1.5	1.7	1.7	1.8	1.8	1.8	1.6	1.4
2	Riffle	2.2	2.2	1.9	2	1.9	2.1	2.0	2.0	2.0	2.1
3	Pool	3.6	3.9	3.6	3.5	3.0	3.1	3.3	2.5	2.5	2.1
4	Riffle	1.9	2	1.7	1.9	1.9	2.1	2.1	1.8	2.1	1.9
Average Riffles		2.1	2.1	1.8	2.0	1.9	2.1	2.1	1.9	2.1	1.4
Average Pools		2.8	2.9	2.6	2.6	2.4	2.5	2.6	2.3	2.2	2.1
Average All		2.4	2.5	2.2	2.3	2.1	2.3	2.3	2.1	2.1	1.8

Table 6. Bankfull widths at four channel cross-section transects from 2013-2022.

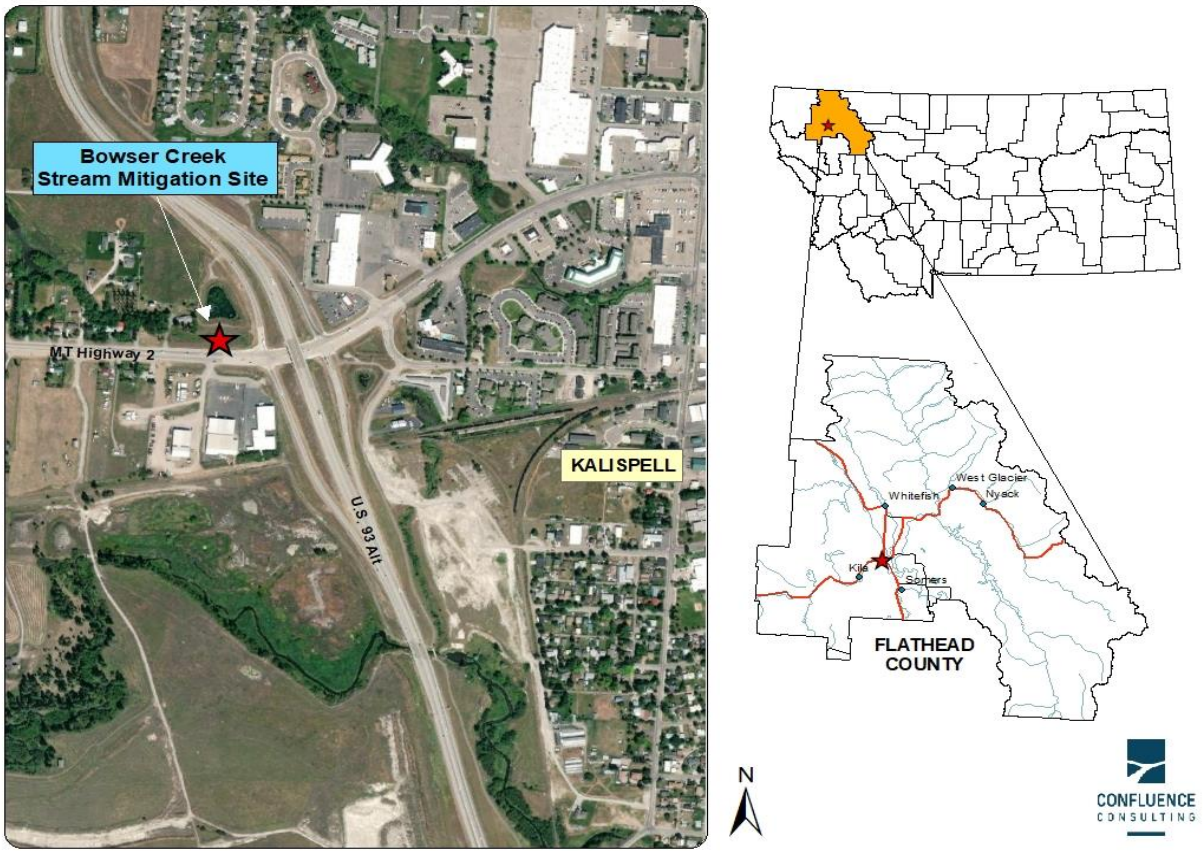
Transect	Type	Bankfull Width (ft)									
		2013	2014	2015	2016	2017	2018	2019	2020	2021	2022
1	Pool	6.0	6.1	5.0	6.0	6.3	6.4	5.9	6.0	6.5	6.2
2	Riffle	12.7	13.5	12.5	11.8	12.8	13.1	12.6	12.4	12.9	12.2
3	Pool	14.8	13.8	13.6	13.8	13.5	13.7	13.6	14.5	15.2	15.1
4	Riffle	7.8	8.1	7.6	7.5	7.5	7.3	7.3	7.6	7.6	7.9
Average Riffles		10.3	10.8	10.1	9.7	10.2	10.2	10.0	10.0	10.3	10.0
Average Pools		10.4	10.0	9.3	9.9	9.9	10.1	9.8	10.2	10.9	10.9
Average All		10.3	10.4	9.7	9.8	10.0	10.1	9.9	10.1	10.6	10.4

Conclusions

The Bowser Creek stream mitigation site is meeting all performance standards except for the percent survival of planted trees and shrubs, and some of the qualitative channel stability criteria. Besides less-than-desirable cover from woody vegetation, the site is well vegetated and has limited noxious weed cover. Loss of pool habitat due to sedimentation may be problematic if the stream does not have enough energy to flush out the sediment. MDT will be coordinating with the USACE to discuss performance standards and future monitoring of this site.

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/publications/brochures/stream-mitigation.aspx

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). 2020. *National Wetland Plant List* (Version 3.5), 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
Flathead

Imagery Date: 9/28/2022

CONFLUENCE CONSULTING

Legend

- Photo Points
- 2014 Channel Center
- Major Station (100')
- Minor Station (25')
- 2022 Channel Thalweg
- Pool and Riffle Transects
- Riparian Transects

N

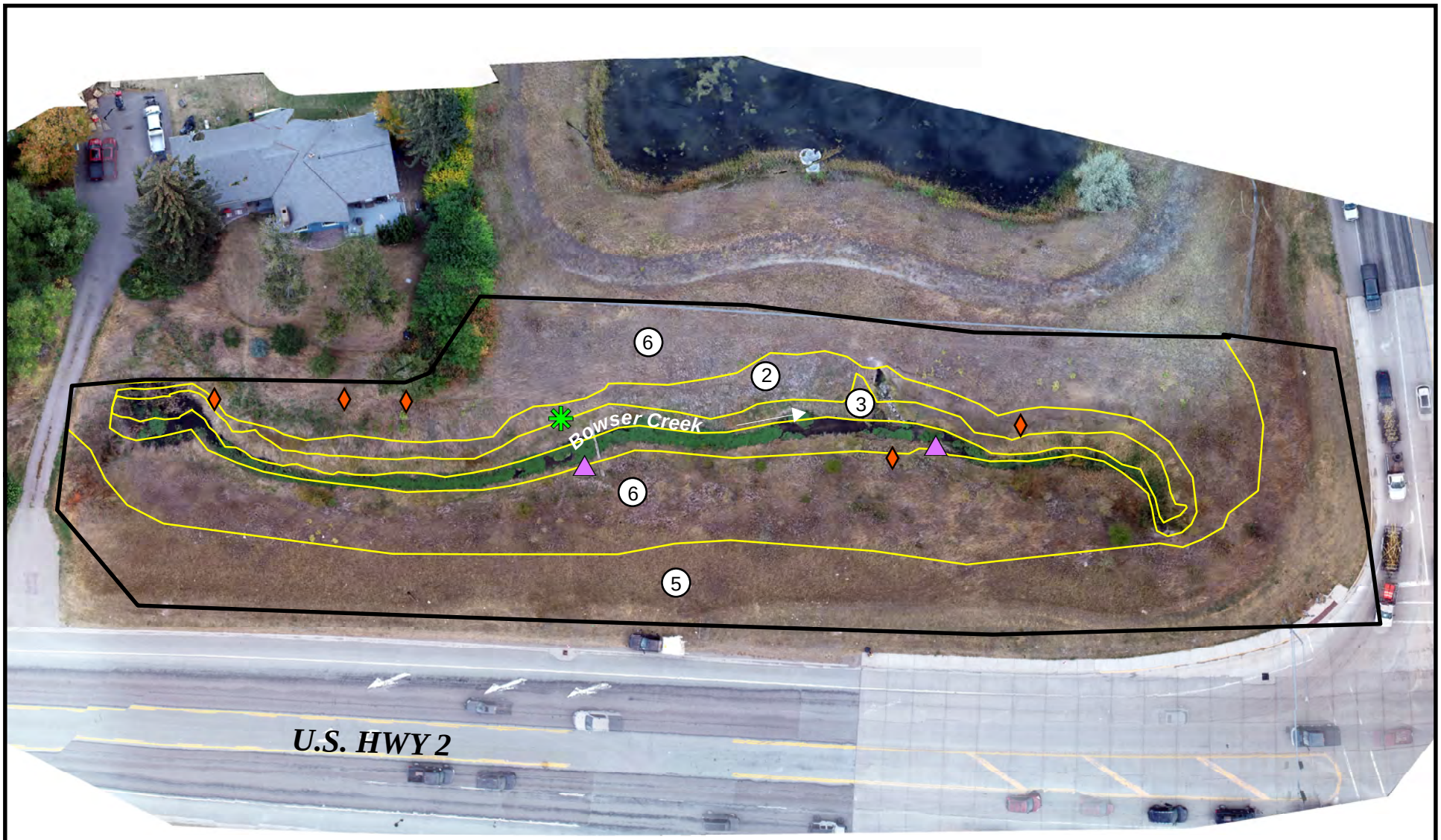
0 25 50 100 Feet

Bowser Creek - 2022 Monitoring Features

Figure 2

Map Date: 2/10/2023

Bowser_features2022.mxd



Imagery Date: 9/28/2022

0 25 50 100 Feet

CONFLUENCE CONSULTING

Legend

- Project Boundary
- Vegetation Community Boundary
- Cirsium arvense
- Leucanthemum vulgare
- Linaria vulgaris
- (2) Phalaris Community
- (3) Nasturtium Community
- (5) Elymus/Festuca Community
- (6) Elymus/Bromus Community

N

Bowser Creek - 2022 Noxious Weeds and Vegetation Community

Figure 3

Map Date: 12/9/2022

Bowser_monitor2022.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 2022

2013

2022

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

2013

2022

Photo 2.1: View looking northwest at Bowser Creek.

2013

2022

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

MONITORING PHOTO LOG

SITE NAME: Bowser Creek
MONITORING YEAR: 2022

2013

2022

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

2013

2022

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

2013

2022

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

MONITORING PHOTO LOG

SITE NAME: Bowser Creek
MONITORING YEAR: 2022

2013

2022

Additional Photo 1: Prolific watercress growth shown in 2013 was less prevalent in 2022, and duck weed has moved into the plant community

2013

2022

Additional Photo 2: Healed Eroding bank observed in 2013.

2013

2022

Additional Photo 3: Bowser Creek Channel showing abundant aquatic macrophyte growth in 2022.

MONITORING PHOTO LOG

SITE NAME: Bowser Creek
MONITORING YEAR: 2022

2013

2022

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

SURVEY PHOTO LOG

SITE NAME: Bowser Creek
MONITORING YEAR: 2022

Survey Photo 1: T1 looking west upstream.

Survey Photo 2: T1 looking south downstream.

Survey Photo 3: T2 looking west downstream from middle of creek.

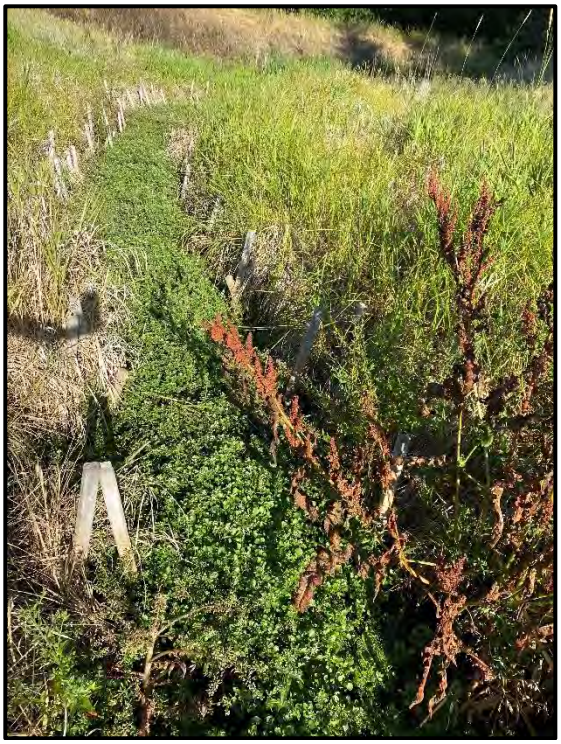
Survey Photo 4: T2 looking east upstream from middle of creek.

SURVEY PHOTO LOG

SITE NAME: Bowser Creek
MONITORING YEAR: 2022

Survey Photo 5: T3 looking east downstream.

Survey Photo 6: T3 looking upstream.



Survey Photo 7: T4 looking upstream.

Survey Photo 8: T4 Right looking downstream.

SURVEY PHOTO LOG

SITE NAME: Bowser Creek
MONITORING YEAR: 2022

Survey Photo 1: T1 looking west upstream.

Survey Photo 2: T1 looking south downstream.

Survey Photo 3: T2 looking west downstream from middle of creek.

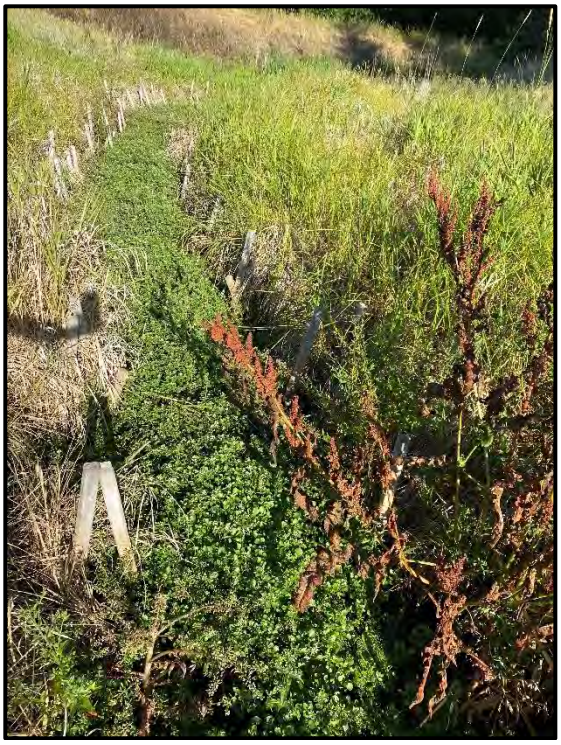
Survey Photo 4: T2 looking east upstream from middle of creek.

SURVEY PHOTO LOG

SITE NAME: Bowser Creek
MONITORING YEAR: 2022

Survey Photo 5: T3 looking east downstream.

Survey Photo 6: T3 looking upstream.



Survey Photo 7: T4 looking upstream.

Survey Photo 8: T4 Right looking downstream.

APPENDIX C
2013 – 2022 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 2022.

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

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

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

* 2020 National Wetland Plant List; Western Mountains, Valleys, and Coast Region (USACE 2020). New species identified in 2022 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 2022. 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*
Agrostis stolonifera	X	1	X	1	FAC
Alnus incana			X	0	FACW
Alopecurus arundinaceus	X	2	X	2	FAC
Artemisia absinthium			X	1	UPL
Bromus inermis	X	1	X	1	UPL
Calamagrostis canadensis			X	0	FACW
Carduus acanthoides	X	0	X	0	UPL
Carex bebbii			X	0	OBL
Carex nebrascensis	X	1	X	0	OBL
Carex pellita	X	3		1	OBL
Carex utriculata	X	1	X	2	OBL
Chamaenerion angustifolium	X	0			FACU
Cirsium arvense	X	1	X	1	FAC
Cirsium vulgare	X	0	X	0	FACU
Cornus alba	X	0	X	0	FACW
Cynoglossum officinale	X	0	X	0	FACU
Elymus repens	X	2	X	1	FAC
Epilobium ciliatum	X	1	X	1	FACW
Equisetum arvense	X	2	X	2	FAC
Galium aparine	X	0			FACU
Geum macrophyllum			X	1	FAC
Glyceria grandis	X	0	X	0	OBL
Hesperis matronalis	X	0			FACU
Juncus balticus	X	1			FACW
Lactuca serriola			X	0	FACU
Leucanthemum vulgare			X	1	FACU
Linaria vulgaris	X	0			UPL
Medicago lupulina			X	0	FACU
Melilotus officinalis	X	0	X	0	FACU
Mentha arvensis	X	0	X	1	FACW
Myosotis scorpioides	X	0	X	0	FACW
*Nasturtium officinale***	X	2	X	2	OBL
Nepeta cataria			X	0	FACU
Lemna minor	X	0	X	0	OBL
*Phalaris arundinacea***	X	4	X	4	FACW
Poa palustris	X	1	X	1	FAC
Poa pratensis	X	1	X	2	FAC
Rosa woodsii	X	0			FACU
Rumex crispus	X	1	X	1	FAC

Streambank Species	Left bank	Left Bank Cover Class	Right bank	Right Bank Cover Class	WMVC Indicator Status*
Salix bebbiana	X	1	X	0	FACW
Salix drummondiana	X	0	X	1	FACW
Salix exigua			X	1	FACW
Solanum dulcamara	X	0	X	0	FAC
Sonchus arvensis	X	1	X	1	FACU
Taraxacum officinale	X	0	X	0	FACU
Typha angustifolia	X	1			OBL
Typha latifolia	X	0	X	0	OBL
Verbascum thapsus	X	0	X	0	FACU
Veronica americana	X	0	X	0	OBL

* 2020 National Wetland Plant List; Western Mountains, Valleys, and Coast Region (USACE 2020)

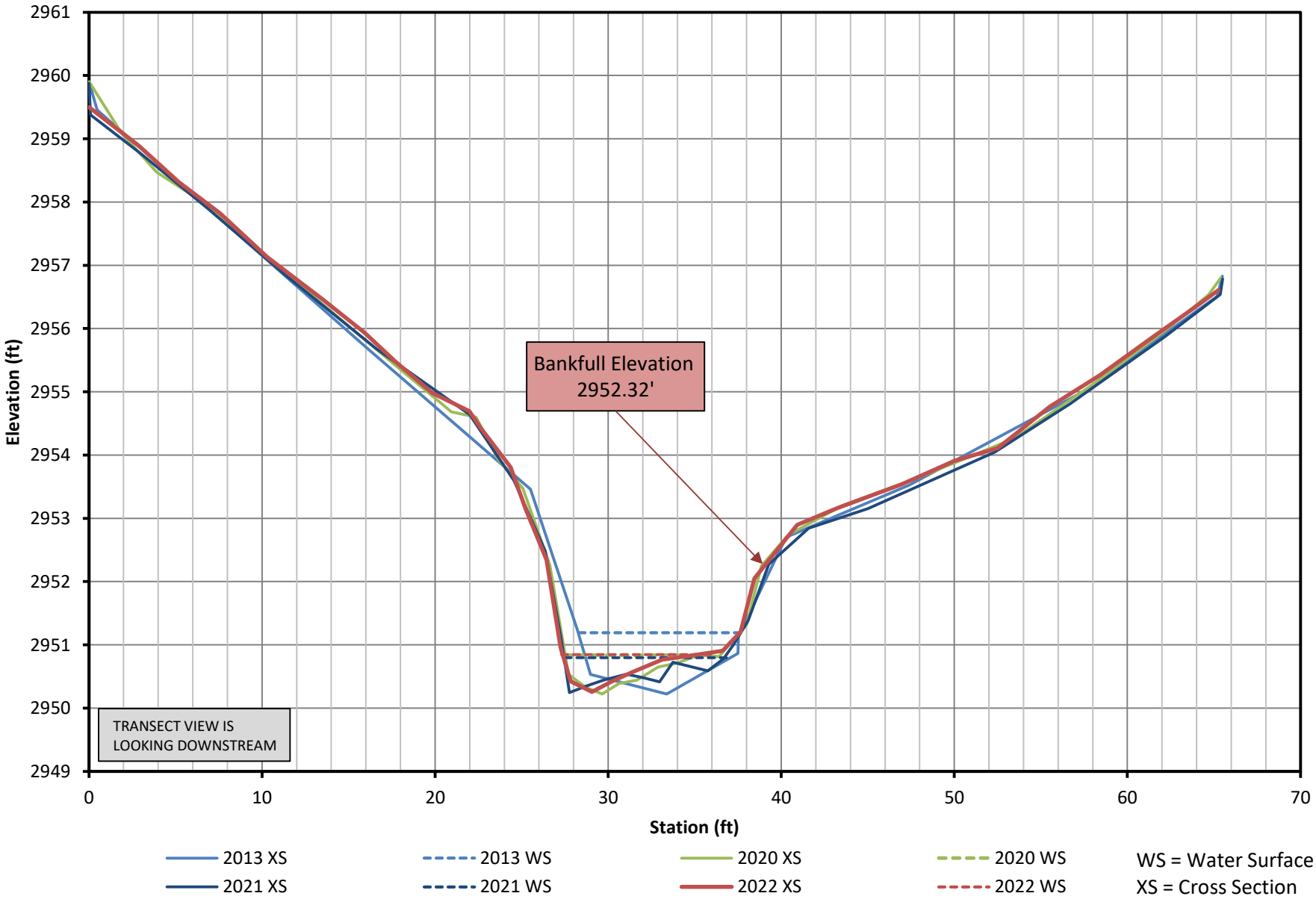
*** Dominant species observed along Bowser Creek stream banks*

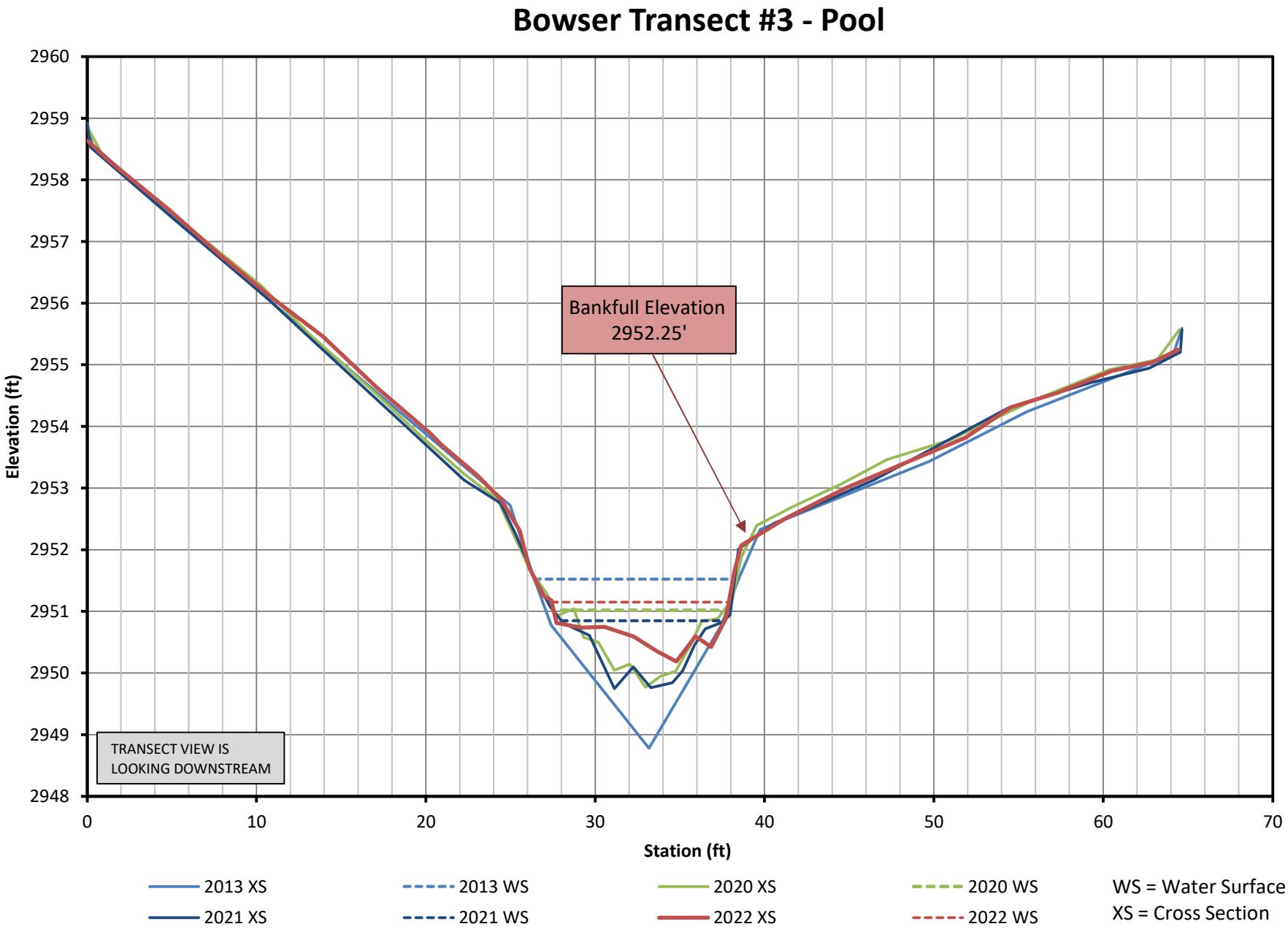
**** Dominant species observed along Bowser Creek stream bed*

APPENDIX E
PERPENDICULAR TRANSECT PLOTS and LONGITUDINAL PROFILE

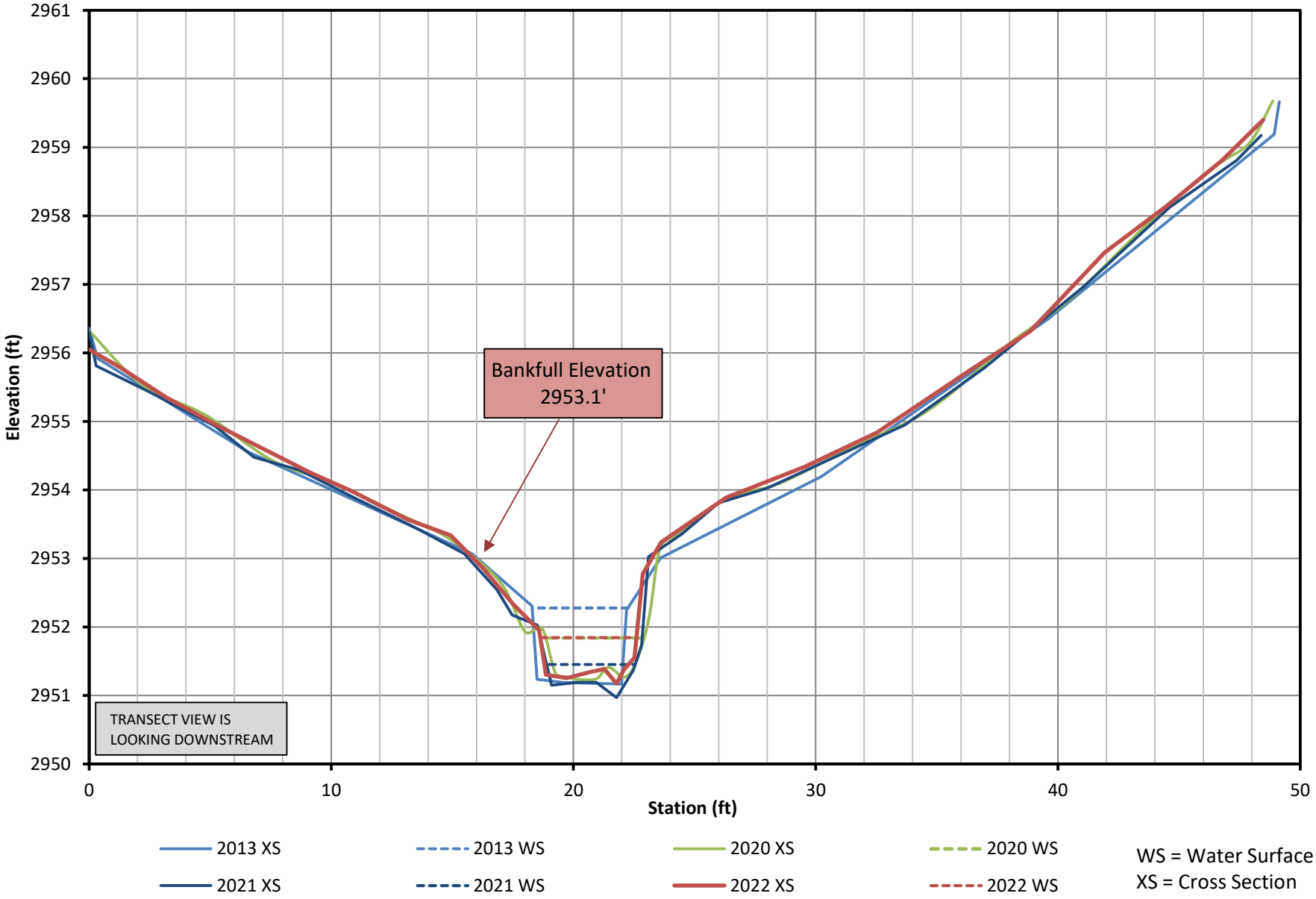
MDT Streams Mitigation Monitoring
Bowser Creek
Flathead County, Montan

Bowser Transect #2 - Riffle

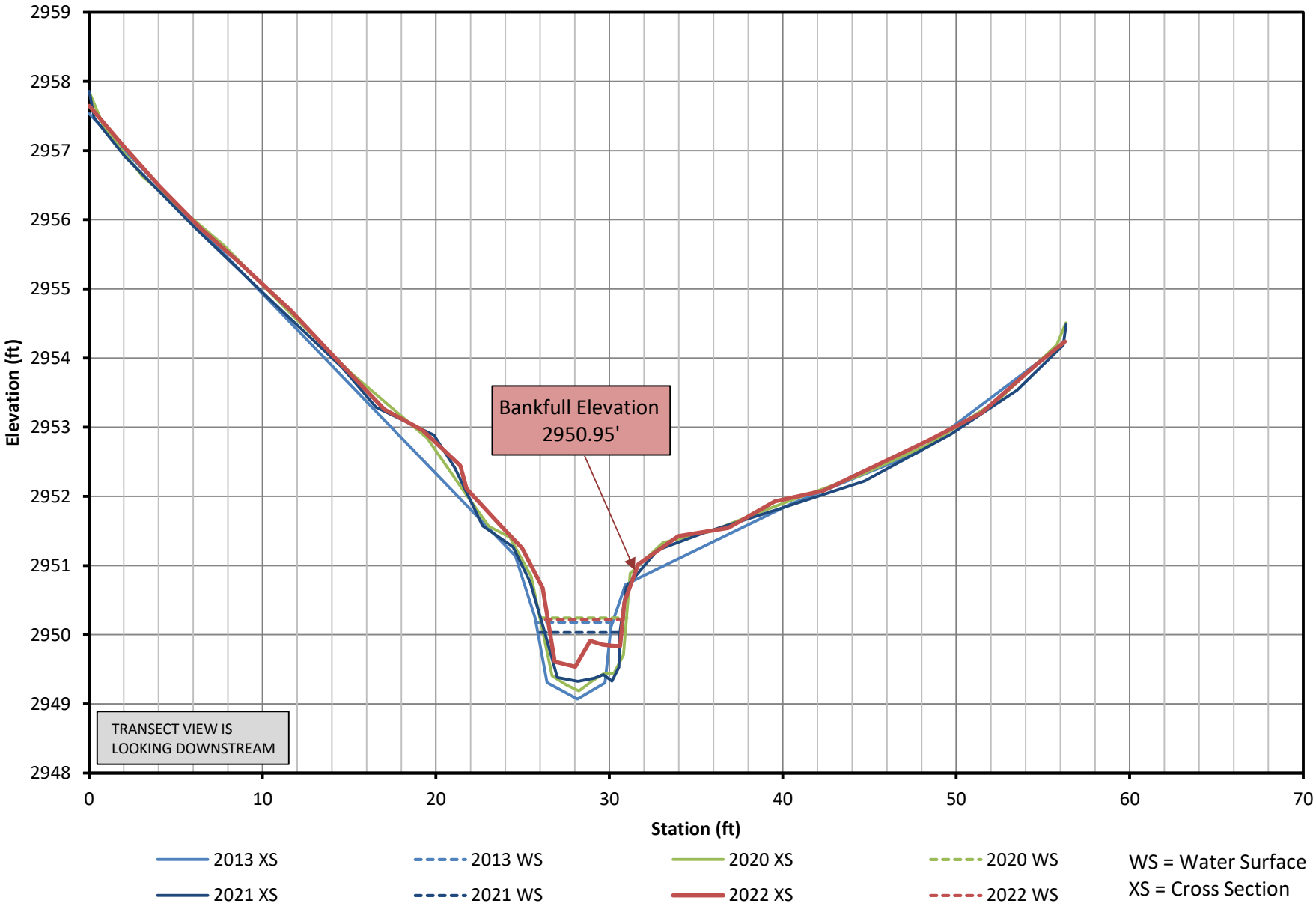



Bowser Transect #3 - Pool
Elevation (ft)
2960
2959
2958
2957
2956
2955
2954
2953
2952
2951
2950
2949
2948
0
10
20
30
40
50
60
70
Station (ft)
Bankfull Elevation
2952.25'
TRANSECT VIEW IS
LOOKING DOWNSTREAM
2013 XS
2013 WS
2020 XS
2020 WS
2021 XS
2021 WS
2022 XS
2022 WS
WS = Water Surface
XS = Cross Section

Bowser Transect #4 - Riffle



Bowser Transect #1 - Pool



Bowser Creek Longitudinal Profiles