Montana Department of Transportation Stream Mitigation Monitoring Report

BOWSER CREEK MITIGATION SITE

Project Overview

Watershed: Watershed #4 - Flathead

Monitoring Year: 2020

Years Monitored: 8th year of monitoring

Corps Permit Number: NWO-2009-018098-MTM

Monitoring Conducted By: Confluence Consulting Inc.

Monitoring Dates: July 31-August 1, 2020

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 the previous channel 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: Yes

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

Dates of any recent corrective or maintenance activities (since previous report):
Activity: Weed contractor treated the site in the Fall of 2019 but was unable to do so in the Fall of 2020 due to early snowfall. Weed treatment will occur again in early 2021. **Date:** unknown, Fall 2019

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

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 2020 monitoring event indicate the Bowser Creek stream mitigation site is meeting five of the six quantitative performance standards established in the monitoring plan.

Ten years post-construction, the site exhibits 82% non-noxious vegetative cover and noxious weeds comprise 2% of the vegetative cover within the riparian buffer. Combined aerial cover of riparian and stream bank vegetation is 87% 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 38%, 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-noxious weed species by the end of the monitoring period	Y	Vegetation transects indicate 82% 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 2% 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 87%
	b. Planted trees and shrubs must exhibit 50% survival after 5 years.	N	Planted tree and shrub survival documented at 38%.
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 actively eroding banks were observed in 2020. Banks were 100% stable.
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 Vegetation Inventory

Table 2 summarizes the areal percent cover of total vegetation, woody vegetation, and noxious weeds observed along each three-foot wide transect adjacent to the stream, and each 25-foot wide riparian belt transect during the 2013, and 2018 through 2020 monitoring events. In addition to the results for individual transects, Table 2 includes the area-weighted totals for each of these vegetation cover categories.

In 2020 the percent cover in riparian belt transects decreased to 84%, with 7% by woody species and 2% by noxious weeds. Stream bank transects displayed 95% cover, with 4% by woody species and 2% by noxious weeds. More bare ground was observed within riparian areas (16%), as compared to stream bank areas (5%), likely a result of the 2018 through 2020 herbicide applications within areas previously dominated by Canada thistle (*Cirsium arvense*). While bare ground increased within both the riparian and stream bank areas over the past year, noxious weed cover decreased by 2%. In total, using a length-based weighted average of vegetation cover for riparian and stream bank transects, the site exhibited 87% total vegetation cover, with 6% by woody species and 2% by noxious weeds (Table 2).

Table 2. Vegetation cover estimates at the Bowser Creek Stream Mitigation Site in 2013, and 2018 through 2020.

Belt Transect	Length (ft)	Total % Vegetation Cover				% Woody Cover				% Noxious Weed Cover			
		2013	**2018**	**2019**	**2020**	**2013**	**2018**	**2019**	**2020**	**2013**	**2018**	**2019**	**2020**
Right (South) Riparian	204	100	90	85	82	2	6	6	6	2	15	3	2
Left (North) Riparian	167	100	93	90	87	14	13	10	7	5	17	5	2
Riparian Subtotal		100	91	87	84	8	9	8	7	4	16	4	2
Right (South) Stream Bank	465	100	100	98	95	17	3	4	4	4	7	2	2
Left (North) Stream Bank	465	100	99	98	95	12	5	5	3	4	8	2	2
Stream Bank Subtotal		100	100	98	95	15	4	5	4	4	8	2	2
Area Weighted Total		**100**	**93**	**90**	**87**	**9**	**8**	**7**	**6**	**3**	**14**	**4**	**2**

Dominant species recorded along the riparian and stream bank transects were combined with visual observations in other areas to develop a vegetation community map (Figure 3, Appendix A). Four vegetation community types were observed in 2020 and are included in Table 3.

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 type, with lesser cover provided by creeping meadow-foxtail (*Alopecurus arundinaceus*), Northwest Territory sedge (*Carex utriculata*), creeping wild rye (*Elymus repens*), Nebraska sedge (*Carex nebrascensis*), watercress (*Nasturtium officinale*) along both stream banks, and other hydrophytic species.

Table 3. Vegetation community types observed at Bowser Creek in 2020.

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

Vegetation community Type 3 – *Nasturtium officinale* was identified 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 during the growing season and has expanded to both stream banks between the 2017 through 2020 monitoring events.

Vegetation community Type 5 – *Elymus* spp./*Festuca ovina* was identified along the upper side slopes of the southern and eastern edges 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 commonly observed 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 and nonnative bull thistle to patchily distributed bare ground and an increase in the nonnative smooth brome (*Bromus inermis*). This community expanded in 2020 into areas previously identified as community type 5.

Appendix D provides a comprehensive list of plant species observed on site during the 2013 through 2020 monitoring events. Since 2013, 107 plant species have been identified within the project area, including six new species observed in 2020. Three native and one non-native hydrophytic species were identified for the first time in 2020 and included bluejoint reedgrass (*Calamagrostis canadensis*), Bebb's sedge (*Carex bebbii*), woolly sedge (*Carex pellita*), and narrow-leaf cattail (*Typha angustifolia*). Catnip (*Nepeta cataria*), a non-native upland species, and sticky-willy (*Galium aparin*), a native upland species, were also observed for the first time in 2020. In 2020, 51% of the species observed were hydrophytic based on the 2018 National Wetland Plant List (USACE, 2018).

Stream Bank Vegetation Composition

The stream bank vegetation inventory identified 51 plant species along the banks of Bowser Creek (Appendix D). Reed canary grass comprised 21-50% cover along both stream banks in 2020. The Winward stability ratings are based on vegetation communities rather than individual species; therefore, a vegetation community was assigned to each stream bank based on one or more dominant species (Winward 2000). Vegetation community Type 2 – *Phalaris arundinacea* was the dominant vegetation community observed along the stream banks, with an associated Winward stability rating of 9.

Noxious Weed Inventory

A total of seven Montana Listed 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*) (MDA, 2019). Locations of ten 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, including spotted knapweed, St. Johnswort, and common tansy. A low cover class (1 to 5 percent) was identified for all mapped weed occurrences within the project area. In 2020, a visual estimate of 2% of the project area was colonized by noxious weeds, representing a decrease by 2% since the 2019 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. The reduction in noxious weeds is a result of herbicide application within the project area.

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 2020, 224 planted trees and shrubs were identified, with 190 of those observed 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, 38% (224 of 505) have survived ten years following construction. While a few of the surviving shrubs have grown to between 4 and 5 feet tall, most of these shrubs are small and do not substantially contribute to the site's woody cover. Many of the surviving shrubs were observed with poor vigor, particularly in areas that had been recently sprayed with herbicide. Overall, the project area includes less than 10% areal cover by woody species.

Table 4. Woody plant survival at Bowser Creek stream mitigation site from 2013 through 2020.

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%

Bank Erosion Inventory

No eroding banks were observed at Bowser Creek in 2020, and the banks were 100% stable. One eroding bank had previously been documented at the mitigation site along a 15-foot segment of the left (north) bank. This eroding bank was caused by a seep that emerges from the north side of the channel and saturates the bank. Bank erosion was noted in this location

from 2017 through 2019, in the form of minor bank sloughing. In 2020, the eroding bank has stabilized by wetland vegetation and therefore was removed from the eroding bank inventory.

Channel Form

The annually surveyed longitudinal profiles and cross-sectional transects indicate Bowser Creek has remained relatively stable throughout the monitoring period. Three riffles and two pools have been maintained since 2014, although 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, Appendix E). 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. At this point, the severity of this problem is low and may correct itself over time. No corrective action is recommended at this time.

Transect data indicates that the bankfull width of the channel has also remained quite stable through the monitoring period, with the exception of Transect #3. The bankfull channel at Transect #3 has widened and become shallower by almost one foot since 2019. 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.

Table 5. Maximum depths and bankfull widths at four cross-section transects from 2013-2020.

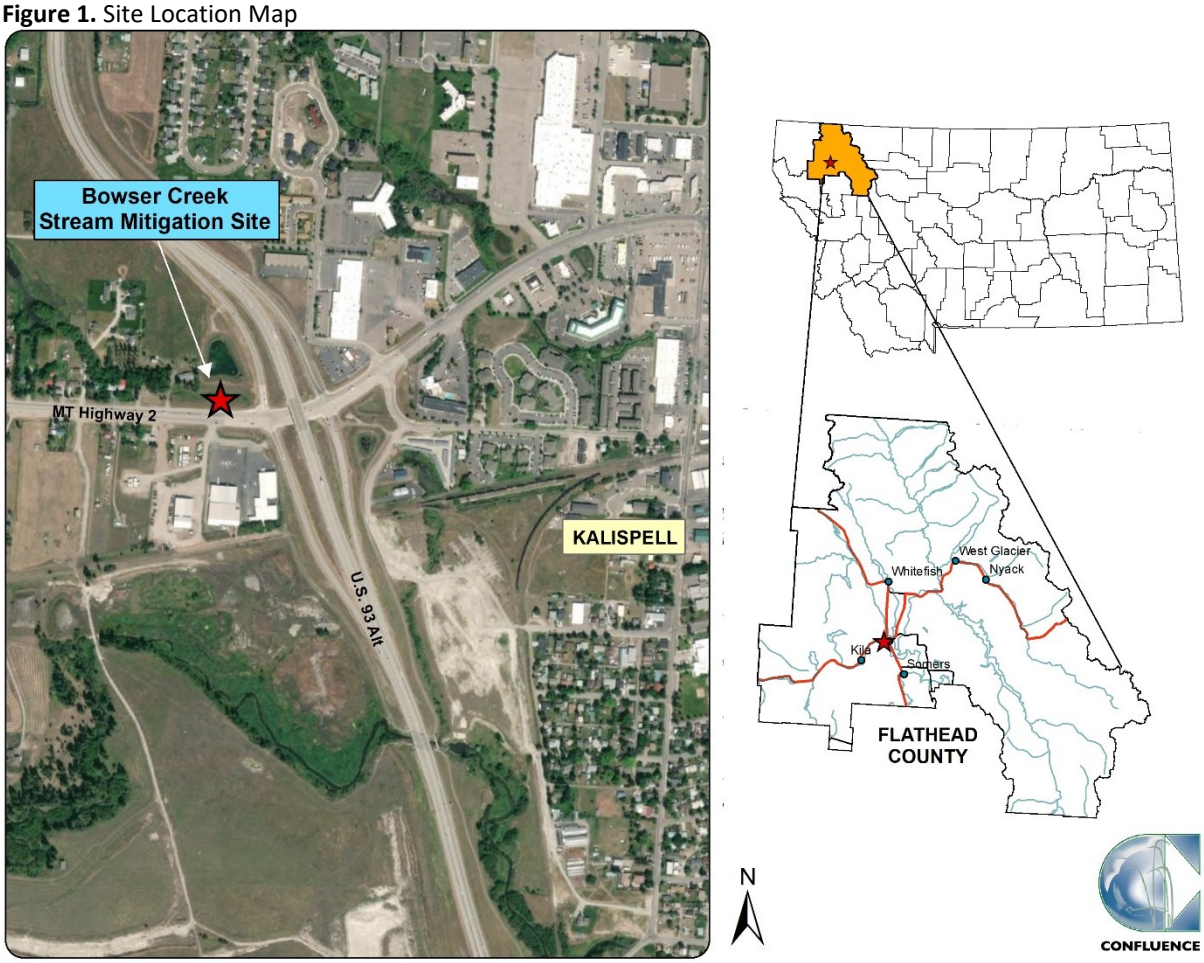
Transect	Type	Max Depth (ft)								Bankfull Width (ft)							
		2013	2014	2015	2016	2017	2018	2019	2020	2013	2014	2015	2016	2017	2018	2019	2020
1	Pool	1.9	1.9	1.5	1.7	1.7	1.8	1.8	2.0	6.0	6.1	5.0	6.0	6.3	6.4	5.9	6.0
2	Riffle	2.2	2.2	1.9	2	1.9	2.1	2.0	2.0	12.7	13.5	12.5	11.8	12.8	13.1	12.6	12.4
3	Pool	3.6	3.9	3.6	3.5	3.0	3.1	3.3	2.5	14.8	13.8	13.6	13.8	13.5	13.7	13.6	14.5
4	Riffle	1.9	2	1.7	1.9	1.9	2.1	2.1	1.8	7.8	8.1	7.6	7.5	7.5	7.3	7.3	7.6
Average Riffles		2.1	2.1	1.8	2.0	1.9	2.1	2.1	1.9	10.3	10.8	10.1	9.7	10.2	10.2	10.0	10.0
Average Pools		2.8	2.9	2.6	2.6	2.4	2.5	2.6	2.3	10.4	10.0	9.3	9.9	9.9	10.1	9.8	10.2
Average All		2.4	2.5	2.2	2.3	2.1	2.3	2.3	2.1	10.3	10.4	9.7	9.8	10.0	10.1	9.9	10.1

Conclusions

The Bowser Creek mitigation site is meeting all performance standards except for the percent survival of planted tree and shrubs. Planted tree and shrub survival was estimated at 38% in 2020 and did not meet the success criteria of ≥50%. MDT will coordinate with the USACE to discuss performance standards and future monitoring of this site after submission of this monitoring report. The Bowser Creek stream mitigation site is otherwise performing as intended after 8 years of monitoring.

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 October 2020 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

CONFLUENCE
consulting incorporated

Legend

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

N

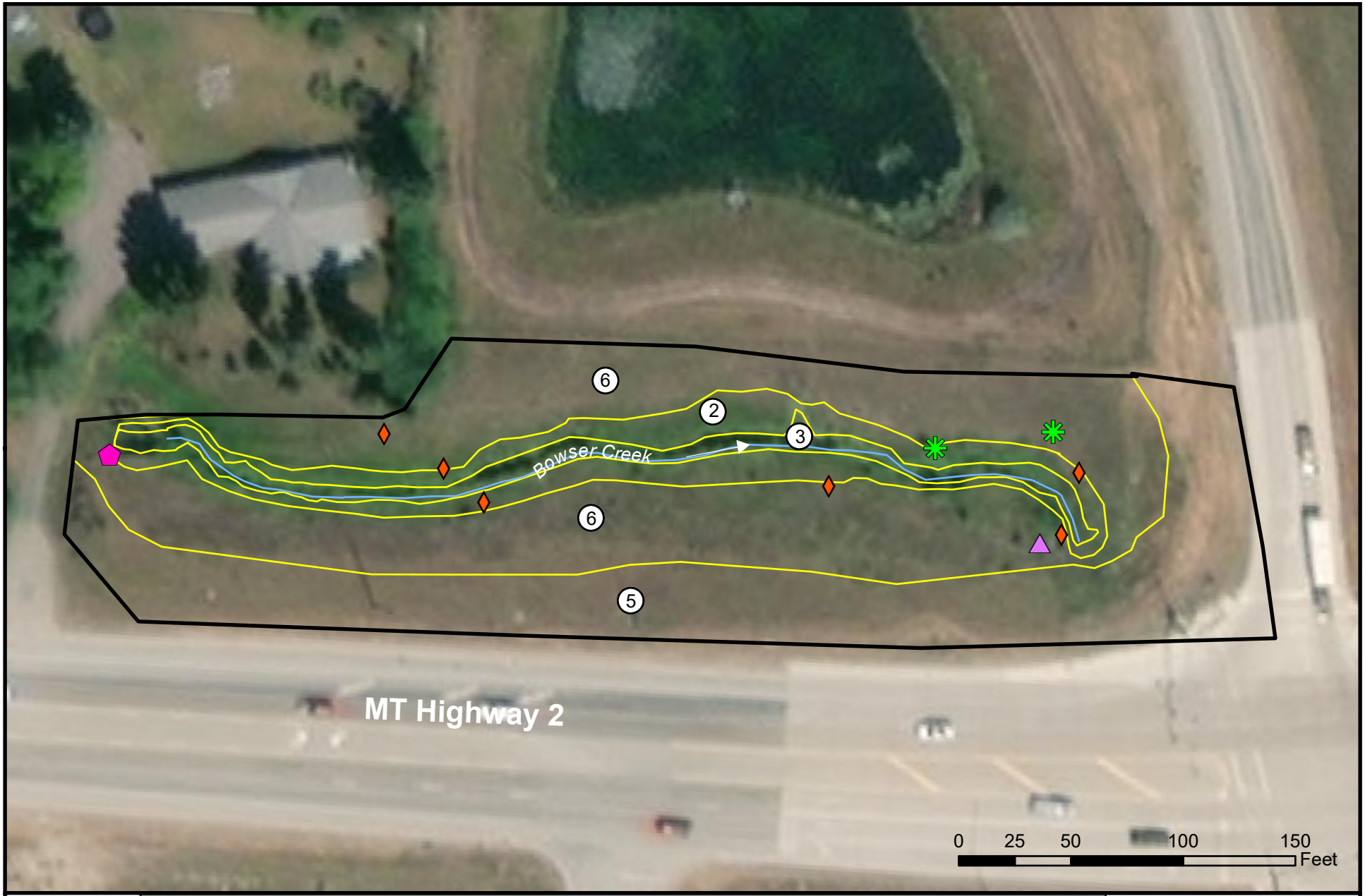
0 37.5 75 150 Feet

Bowser Creek - 2020 Monitoring Features

Figure 2

Date: 10/26/2020

Bowser_features2020.mxd



CONFLUENCE
consulting incorporated

Legend

- Project Boundary
- Vegetation Community Boundary
- Cirsium arvense
- Cynoglossum officinale
- Leucanthemum vulgare
- Linaria vulgaris
- (2) Phalaris arundinacea Community
- (3) Nasturtium officinale Community
- (5) Elymus spp./Festuca ovina Community
- (6) Elymus spp./Bromus inermis Community

N

Bowser Creek - 2020 Noxious Weeds and Vegetation Community

Figure 3

Date: 10/22/2020

Bowser_monitor2020.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 2020

CONFLUENCE

2013

2020

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

2013

2020

Photo 2.1: View looking northwest at Bowser Creek.

2013

2020

Photo 2.2: View across Bowser Creek looking north.

MONITORING PHOTO LOG

SITE NAME: Bowser Creek
MONITORING YEAR: 2013 and 2020

2013

2020

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

2013

2020

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

2013

2020

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

MONITORING PHOTO LOG

SITE NAME: Bowser Creek
MONITORING YEAR: 2013 and 2020

2013

2020

Additional Photo 1: Prolific watercress growth shown in 2013 was less prevalent in 2020.

2013

2020

Additional Photo 2: Eroding bank EBL3.

2013

2020

Additional Photo 3: Widened channel segment.

SURVEY PHOTO LOG

SITE NAME: Bowser Creek
MONITORING YEAR: 2020

CONFLUENCE

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: 2020

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.

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: 2020

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: 2020

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: 2020

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: 2020

Survey Photo 31: T4 Right looking west upstream.

Survey Photo 32: T4 Right looking east downstream.

APPENDIX C
2013 – 2020 COMPREHENSIVE PLANT SPECIES LIST

MDT Streams Mitigation Monitoring
Bowser Creek
Flathead County, Montana

Comprehensive list of plant species observed at the Bowser Creek Stream Mitigation Site from 2013 through 2020.

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
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 Reedgrass**	**FACW**
Carduus acanthoides	Spiny Plumeless Thistle	UPL
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
Epilobium ciliatum	Fringed Willowherb	FACW

Scientific Name	Common Name	WMVC Indicator Status*
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
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
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
Prunus virginiana	Choke Cherry	FACU
Ranunculus sp.	Buttercup	N/A

Scientific Name	Common Name	WMVC Indicator Status*
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

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

New species identified in 2020 are **bolded**

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

APPENDIX D
2020 STREAM BANK VEGETATION COMPOSITION

MDT Streams Mitigation Monitoring
Bowser Creek
Flathead County, Montana

Plant species and their associated cover classes along the stream banks of the Bowser Creek stream mitigation site in 2020.

Classification Values and 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	0	FAC
Alnus incana			X	0	FACW
Alopecurus arundinaceus	X	2	X	2	FAC
Artemisia absinthium			X	0	UPL
Bromus inermis	X	1	X	1	UPL
Calamagrostis canadensis			X	0	FACW
Carex bebbii			X	0	OBL
Carex nebrascensis	X	2	X	1	OBL
Carex pellita	X	0			OBL
Carex utriculata	X	2	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		0	X	0	FACU
Elymus repens	X	2	X	0	FAC
Epilobium ciliatum	X	1	X	0	FACW
Equisetum arvense	X	1	X	1	FAC
Geum macrophyllum			X	0	FAC
Galium aparine	X	0			FACU
Helianthus maximiliani	X	0	X	1	UPL
Juncus balticus	X	1			FACW
Lactuca serriola			X	0	FACU
Leucanthemum vulgare			X	0	FACU
Medicago lupulina			X	0	FACU
Nepeta cataria			X	0	FACU
Thlaspi arvense	X	0			UPL
Melilotus officinalis			X	0	FACU
Mentha arvensis	X	0	X	1	FACW
Myosotis scorpioides	X	0			FACW
*Nasturtium officinale***	X	2	X	2	OBL
Persicaria amphibia	X	0			OBL
*Phalaris arundinacea***	X	4	X	4	FACW

Streambank Species	Left bank	Left Bank Cover Class	Right bank	Right Bank Cover Class	WMVC Indicator Status*
Poa palustris	X	1	X	0	FAC
Poa pratensis	X	1	X	1	FAC
Rosa woodsii	X	0			FACU
Rumex crispus	X	0	X	0	FAC
Salix bebbiana	X	1	X	0	FACW
Salix drummondiana	X	0	X	1	FACW
Salix exigua			X	1	FACW
Scirpus microcarpus	X	0			OBL
Solanum dulcamara	X	0	X	0	FAC
Sonchus arvensis	X	0	X	1	FACU
Taraxacum officinale	X	0	X	0	FACU
Trifolium pratense	X	0			FACU
Trifolium repens	X	0			FAC
Typha latifolia	X	1	X	1	OBL
Typha angustifolia	X	0			FAC
Verbascum thapsus	X	0	X	0	FACU
Veronica americana			X	0	OBL
Vicia americana	X	0	X	0	FAC

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

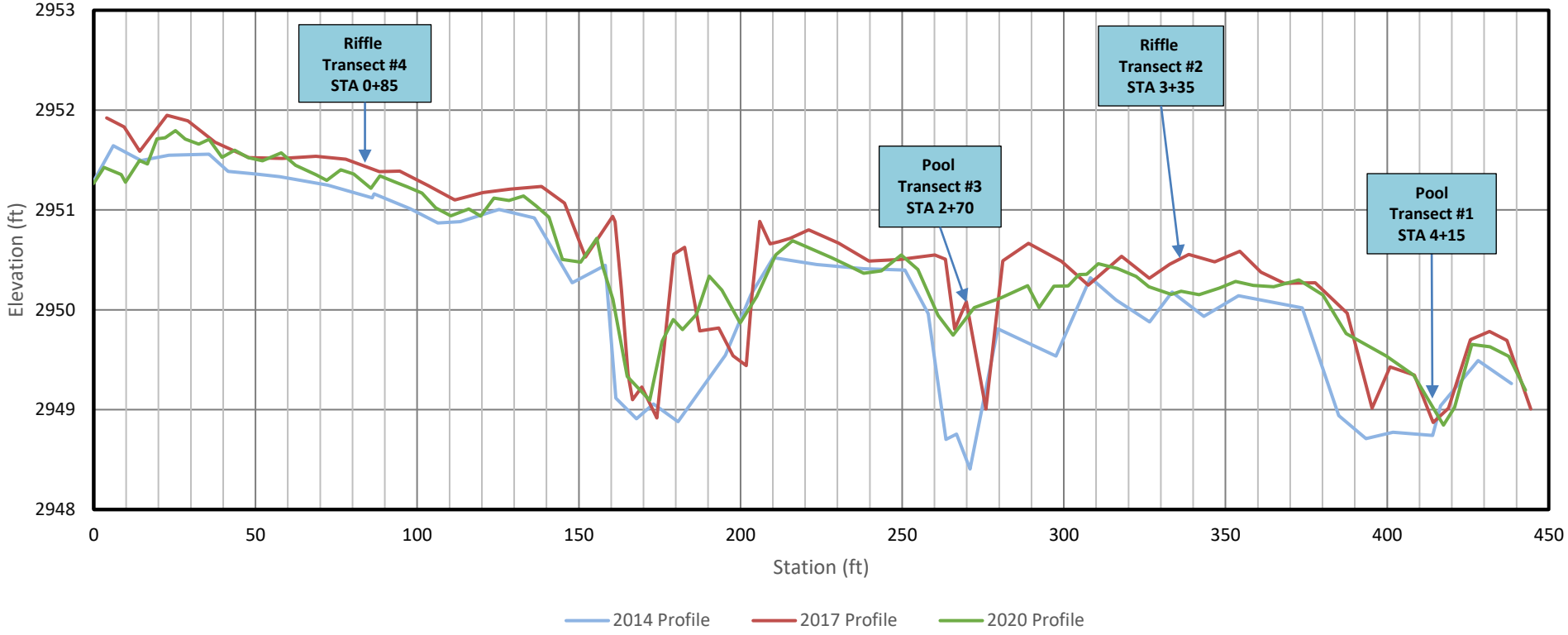
*** Dominant species observed along Bowser Creek stream banks*

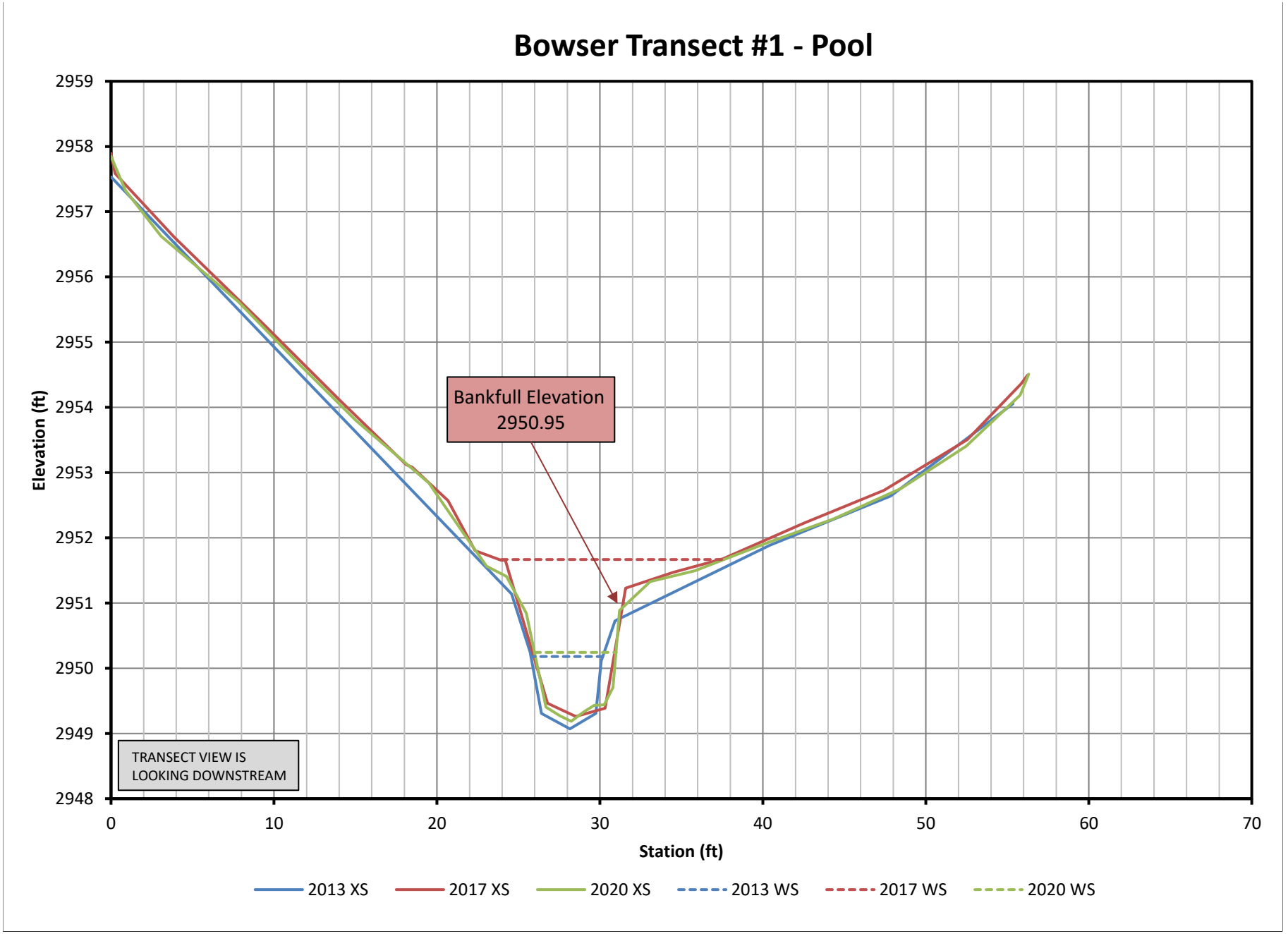
**** Dominant species observed along Bowser Creek stream bed*

APPENDIX E
LONGITUDINAL PROFILE AND PERPENDICULAR TRANSECT PLOTS

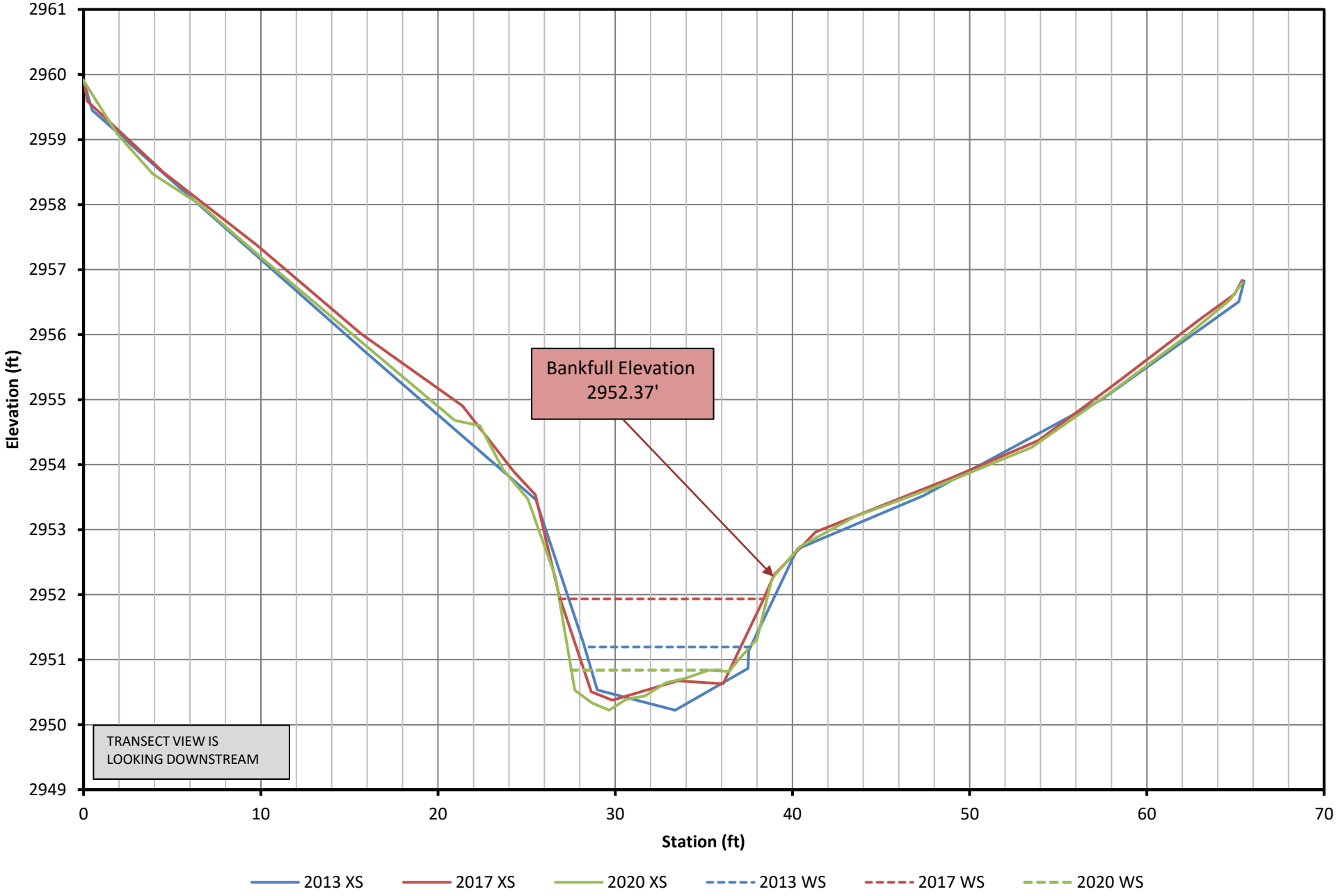
MDT Streams Mitigation Monitoring
Bowser Creek
Flathead County, Montana

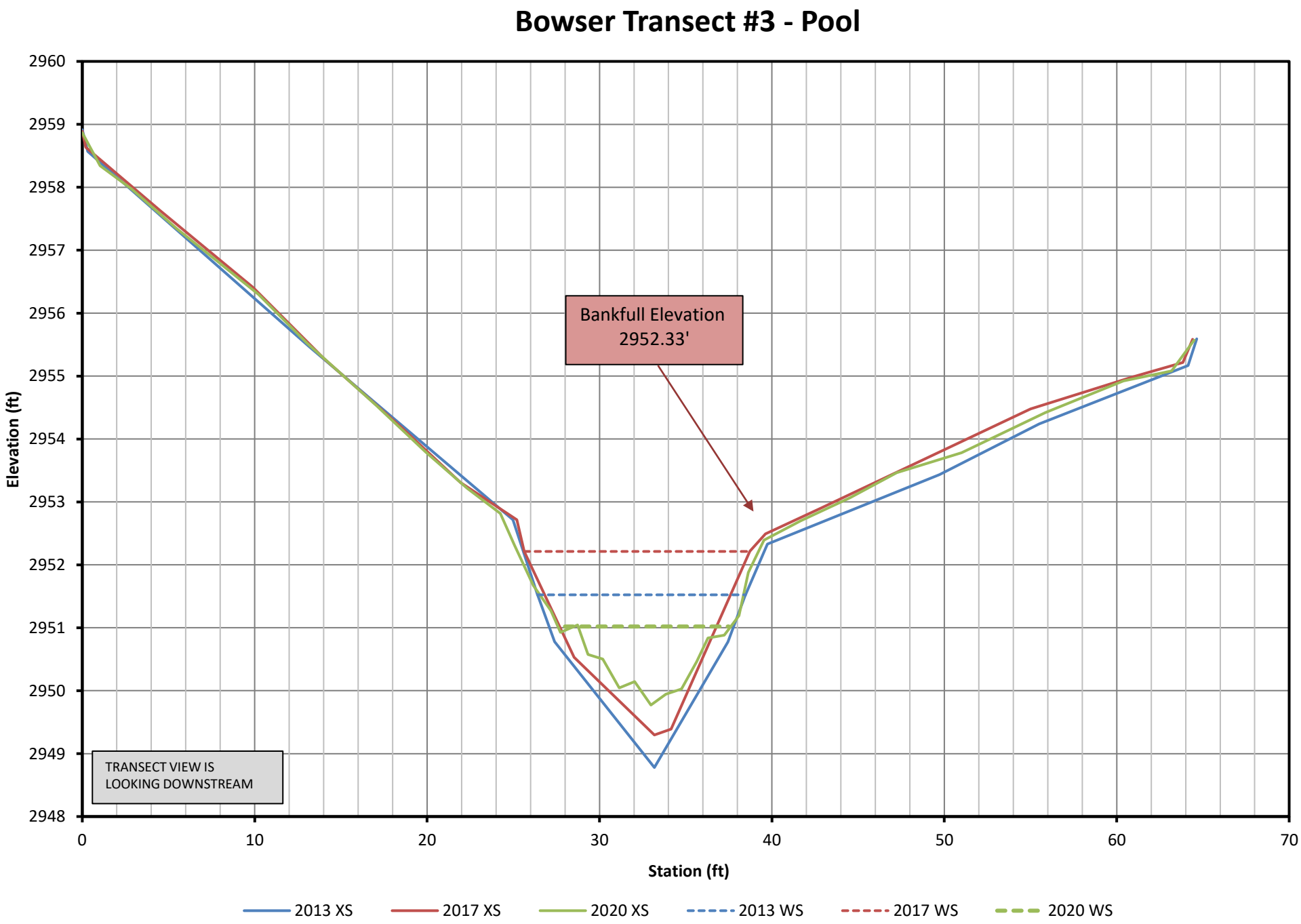
Bowser Creek Longitudinal Profiles




Bowser Transect #1 - Pool
Elevation (ft)
2959
2958
2957
2956
2955
2954
2953
2952
2951
2950
2949
2948
0
10
20
30
40
50
60
70
Station (ft)
Bankfull Elevation
2950.95
TRANSECT VIEW IS
LOOKING DOWNSTREAM
2013 XS
2017 XS
2020 XS
2013 WS
2017 WS
2020 WS

Bowser Transect #2 - Riffle




Bowser Transect #3 - Pool
Elevation (ft)
2960
2959
2958
2957
2956
2955
2954
2953
2952
2951
2950
2949
2948
Bankfull Elevation
2952.33'
TRANSECT VIEW IS
LOOKING DOWNSTREAM
0
10
20
30
40
50
60
70
Station (ft)
2013 XS
2017 XS
2020 XS
2013 WS
2017 WS
2020 WS

Bowser Transect #4 - Riffle