
MONTANA DEPARTMENT OF TRANSPORTATION STREAM MITIGATION MONITORING REPORT

*North Fork Bear Creek
Ravalli County, Montana*

*Year Project Completed: 2011
Monitoring Report #7: Submitted December, 2019*



Prepared for:



Prepared by:



MONTANA DEPARTMENT OF TRANSPORTATION

STREAM MITIGATION MONITORING REPORT #6

YEAR 2019

*North Fork Bear Creek
Ravalli County, Montana*

MDT Project Number: NH-7-1(114)56
Control Number: 2015 003

MTFWP: MDT-R2-64-2010
USACE: NWO-1997-90821-MTH

Prepared for:

MONTANA DEPARTMENT OF TRANSPORTATION
2701 Prospect Ave
Helena, MT 59620-1001

Prepared by:

Confluence Consulting, Inc.
P.O. Box 1133
Bozeman, MT 59771

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1.0 INTRODUCTION

The following report presents results for the seventh year of post stream re-construction monitoring at the U.S. Highway 93 crossing at North Fork Bear Creek near Victor, Montana. This report includes an evaluation of monitoring results in comparison to performance standards outlined in the post-construction monitoring plan for the site. The mitigation site is to be monitored for a minimum of five years to evaluate compliance toward meeting performance standards. The project was constructed in 2011; therefore, these results provide documentation of the site's condition eight years following the project's completion. Annual monitoring of the site began in 2013.

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 watermark of the stream corridor.

Performance standards outlined in the mitigation plan for the reconstructed segment of the North Fork Bear Creek include:

1. Riparian Vegetation Coverage

- a) Greater than 50% areal coverage of desirable perennial plants within the riparian buffer zone. Desirable plants include seeded species and those colonizing from adjacent undisturbed habitats.
- b) Greater than 25% areal coverage of woody riparian shrubs and/or trees within the riparian buffer zone.
- c) Less than 10% areal coverage of Montana State listed noxious weeds within the riparian buffer zone.

2. Stream Bank Stability

- a) Less than 25% of total bank length exhibiting signs of active erosion/cutting.

Additional reporting requirements outlined in the monitoring plan include:

1. **As-built** - An as-built drawing will be prepared with a list of plantings for the riparian areas within the stream channel construction zone.
2. **Weed Control** - Monitoring will include identification of state designated noxious weeds and an estimate of areal coverage of each weed species.

3. **Photo Points** - A minimum of 4 photo points will be established to document conditions along the newly constructed sections.
 - a) Photo points will be established to show upstream and downstream bank conditions at bridge locations.
 - b) Streambank reconstruction not associated with bridges will include photo points from upstream and downstream angles.

Results of the seventh year of monitoring in 2019 are presented in Section 4, and are compared to the adopted performance standards in Section 5. A site map of the project area is included in Appendix A, photo-documentation of the site during the 2013 and 2019 monitoring events in Appendix B, 2013 through 2019 comprehensive plant species list in Appendix C, and 2019 noxious weed list in Appendix D. The as-built topographic survey of the project site as surveyed in 2013 is included in Appendix E as well as the design schematics for the project area.

2.0 SITE LOCATION

The monitoring reach includes approximately 300 feet of the North Fork of Bear Creek, extending 110 feet upstream and 100 feet downstream of the U.S. 93 Bridge (plus 90 feet beneath the bridge). The project site is located in Section 31, Township 8 North, Range 20 West, and is approximately one mile south of Victor, Montana (Figure 1).

In 2019, western Montana was characterized by an overall average to above average winter snowpack, cool and wet spring, and short, wet summer (NRCS 2019). Despite the snowpack and wet spring and summer conditions, the North Fork of Bear Creek was dry during the August 2019 monitoring event (see all monitoring photos in Appendix B). Annual monitoring at this site indicates the channel typically goes dry during late summer, even in years when annual snowpack and precipitation is above average.

3.0 MONITORING METHODS

Monitoring field crews visited the project site on August 12th, 2019. Annual field data collection followed methodologies as described in the 2013 monitoring report, which can be accessed at https://www.mdt.mt.gov/other/webdata/external/planning/STREAM-MITIGATION/2013_REPORTS/2013_NF_BEAR_CREEK_MONITORING_REPORT.PDF

4.0 RESULTS

4.1. Riparian Vegetation Inventory

Results of the 2013 through 2019 visual estimates of areal coverage are summarized in Table 1. In 2019, approximately 10% of the project site was bare ground, with 52% of the area vegetated with herbaceous species and 38% with woody species. Overall results as compared with the 2018 monitoring results were very similar, with a minimal increase in woody cover from 36% to 38%. This result is due to continued maturation of woody species and newly observed volunteer species following seven growing seasons

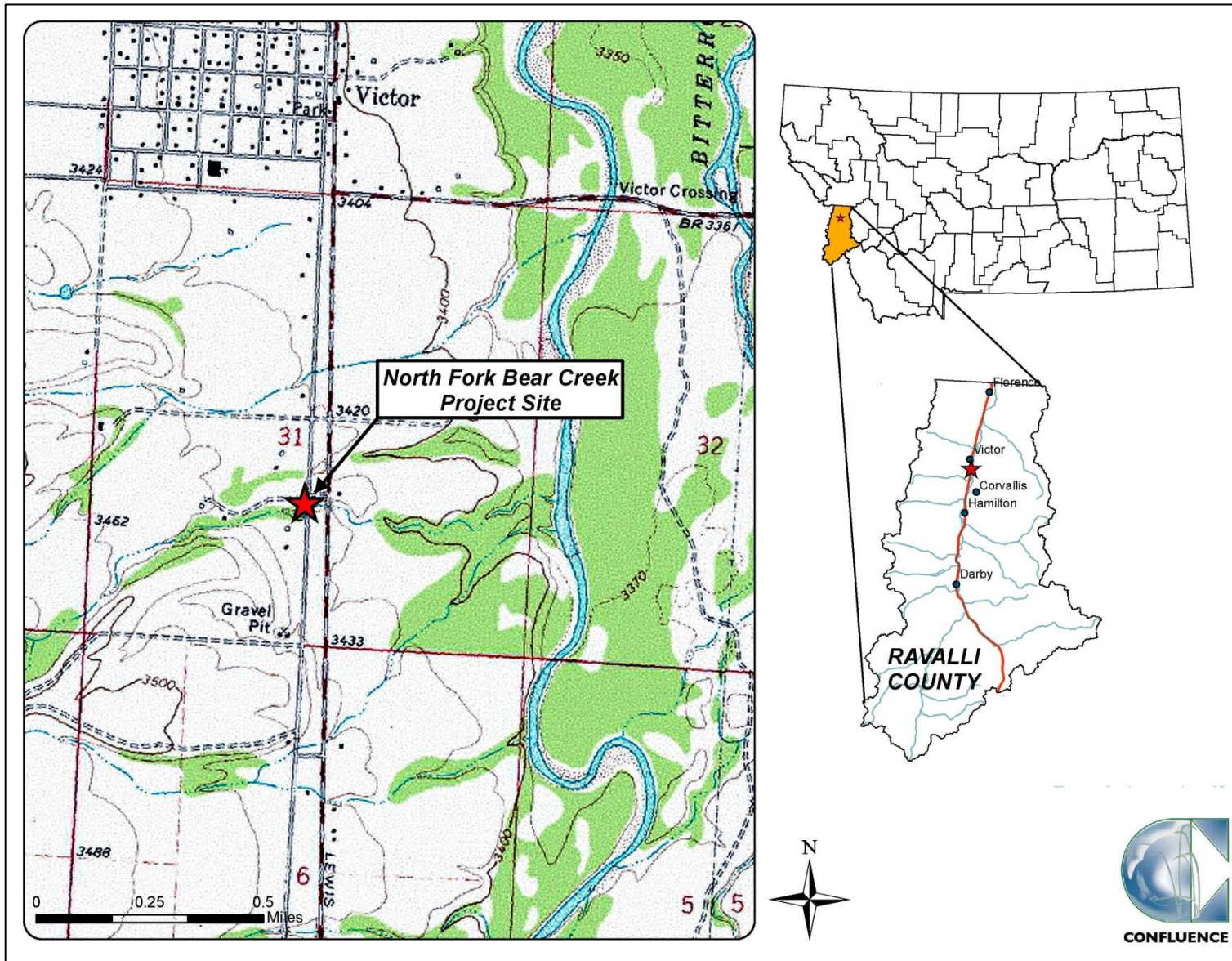


Figure 1. Project location of North Fork Bear Creek stream mitigation site.

since monitoring efforts began. The site exhibited an overall increase in noxious weed cover, from 30% areal coverage in 2018 to 33% in 2019. This increase is primarily a result of the increased spotted knapweed (*Centaurea stoebe*), a biennial to short-lived perennial, observed across the site.

Table 1. Visual estimate of plant coverage at North Fork Bear Creek Stream Mitigation Site from 2013 through 2019.

| 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 |

*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 2019. The comprehensive list includes 121 species, representing an increase by 1 species¹ since 2018, 10 species since 2017, 12 species since 2016, 26 species since 2015, 54 species since 2014, and 76 species since 2013. In 2019, 40% of species observed were hydrophytic based on the 2016 National Wetland Plant List (Lichvar *et al.* 2016). Narrow-leaf fireweed (*Chamaenerion angustifolium*), a native perennial upland species, was observed for the first time in 2019.

The relatively steep stream bank along the left (north) bank 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 cottonwoods (*Populus* spp.) and grasses (*Poa* spp., *Elymus* spp., *Phleum pratense*, and *Phalaris arundinacea*) are abundant.

Seventeen infestations of Montana Listed Priority 2B noxious weeds were observed within the project area, all of which were classified as low cover class (1-5%) (Appendix D). Two infestations of Priority 1B noxious weeds were found within the riparian corridor and were also considered low cover class (Figure 2 in Appendix A; Appendix D). Cheatgrass (*Bromus tectorum*), a Montana Priority 3 regulated weed species was also observed across the site. Two noxious weed species originally observed in 2014 (*Convolvulus arvensis* and *Cynoglossum officinale*) have not been observed during the past five monitoring events, and as a result, they are no longer considered present within the reach.

An estimated 33% areal coverage of noxious weeds was observed during the 2019 monitoring event. Weeds were observed on both stream banks upstream and

downstream of the Highway 93 Bridge. The percent cover estimates recorded for all vegetation categories may have been influenced by a combination of factors, including, but not limited to, adjacent land management, previous herbicide applications, differences in annual precipitation and temperature, fluctuations in plant phenological events in response to climate. The diversity of factors affecting vegetation composition makes it difficult to determine the exact cause(s) for increases or decreases in coverage. While previous weed spraying efforts by MDT may have reduced areal coverage of noxious weeds, the 33% percent cover by eight noxious weed species remains a concern at this site.

4.2. Bank Erosion Inventory

One eroding bank was identified within the project reach, which occurs just downstream of the highway bridge along the right (south) bank. Erosion along this 25-foot long bank segment was initially observed in 2017 and retreated approximately 3 feet in 2018, capturing an MDT motion camera. The bank did not appear to erode further laterally in 2019, although a minor amount of undercutting beneath the bank was observed. The bank consists of cobble and gravel material and is vegetated with a mixture of herbaceous and woody species including common yarrow (*Achillea millefolium*), narrow-leaf cottonwood (*Populus angustifolia*), Woods' rose (*Rosa woodsii*), and spotted knapweed (*Centaurea stoebe*). Based on photo documentation, it appears the bank retreated approximately 4-5 feet between 2017 and 2018, but has not eroded further in the past year (see photo points 3.2 and 3.3 in Appendix B).

The 25 feet of erosion represents approximately 6% of the 420 feet of stream banks within the monitoring reach. The relatively short extent of erosion and lack of infrastructure in jeopardy of being damaged by continued erosion here makes stabilization or correction efforts unwarranted at this time. No other erosion was noted along the project reach and all root wads installed to prevent erosion upstream and downstream of the bridge appear to be intact and functioning properly. The overall stability through the reach and presence of pool features adjacent to the root wads indicate the channel is functioning properly and has developed natural bedform features.

5.0 COMPARISON OF RESULTS TO PERFORMANCE CRITERIA

Monitoring of the North Fork Bear Creek Stream Mitigation site is intended to document whether the reconstructed segment of the channel is meeting or moving toward meeting performance standards outlined in the North Fork Bear Creek Mitigation Plan. Results from the seventh year of monitoring indicates three of the four performance standards are being met eight years post-construction, including desirable non-noxious perennial species cover, woody vegetation cover, and stream bank stability (Table 2). Percent cover of noxious weed species failed to meet the success criteria of <10%. Photographs of photo points (Appendix B) and as-built drawings (Appendix E) have been provided as additional documentation of the site's condition in this monitoring report.

Table 2. Performance results of North Fork Bear Creek eight years following project completion.

| Monitoring Parameter | Performance Criteria | Status 7 Years Following Construction | Meeting Performance Criteria? |
|----------------------|---|---|-------------------------------|
| Riparian Cover | Greater than 50% aerial coverage of desirable perennial plants, including seeded species and those colonizing from adjacent undisturbed habitats. | Desirable cover estimated at 52% (90% total cover - 33% weed cover - 5% annual/biennial). | Yes |
| | Greater than 25% aerial coverage of woody riparian shrubs and/or trees. | Woody riparian species cover estimated at 38% of project area and increasing over past 5 years | Yes |
| | Less than 10% aerial coverage of site has Montana noxious weeds. | Noxious weed cover is estimated at 33% of the project area. | No |
| Streambank Stability | Less than 25% of total bank length exhibiting signs of active erosion/cutting | Erosion inventory documented 6% of project reach exhibits active erosion/cutting | Yes |

5.1. Riparian Cover

Desirable non-noxious perennial plants including riparian trees, shrubs, and forbs were estimated at 52% cover of the project site. This estimate was calculated by subtracting the sum of the visual estimates for noxious weed cover (33%), bare ground (10%), and annual/biennial cover (5%) from 100. The trend in percent desirable cover from 2015 to 2019 is trending upward and is now meeting the success standard for this monitoring parameter.

Percent cover of woody vegetation has increased by 1-3% per year since the initial monitoring event in 2013. The majority of woody plants include shrubs and trees that existed prior to relocating the channel and volunteer 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 38%, which exceeds the established success criteria for woody cover by 13%

Many noxious weed infestations were observed along both banks of the project reach. Although each individual weed infestation is relatively small in extent, the area of all infestations combined warrants concern and must be addressed to achieve the success

criterion for riparian cover. Future weed management efforts should take into account the presence of wildlife fencing along the riparian corridor upstream and downstream of the U.S. 93 Bridge over the North Fork of Bear Creek.

Attempts at establishing woody riparian vegetation within the project reach included installing cuttings along the banks upstream and downstream of the Highway 93 Bridge. Cottonwood and willow (*Salix* spp.) cuttings installed along the banks were 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 4 to 5 feet of the stem extending above ground. The lack of specialized equipment to install willow stems in rocky/cobbly substrate was likely the limiting factor for installing the cuttings to the proper depth. High mortality of these cuttings can be attributed to the shallow planting depth and inability of the cuttings to quickly extend roots down to the low water table elevation.

5.2. Streambank Stability

The reconstructed stream banks within the project reach have remained largely intact, with erosion noted along only 25 feet, or 6% of the overall bank length. Erosion is limited to one bank segment just downstream of the highway bridge. While erosion at this location resulted in bank retreat by 4-5 feet between 2017 and 2018, no further lateral migration has been noted. Given the length of eroding bank is relatively short and the erosion is not currently threatening any infrastructure (fences, power poles, bridge abutments), bank stabilization efforts are unwarranted at this time.

Root wads placed along the north bank both upstream and downstream of the bridge remain stable eight years following installation. Cobble placed atop one of the rootwads upstream of the bridge partially washed out during 2014; however no additional bank erosion has been noted in this area during the past five years. Given the integrity of the channel, no measures are currently warranted to improve bank stability within the project reach, and the project site is currently meeting success criteria for bank stability.

6.0 LITERATURE CITED

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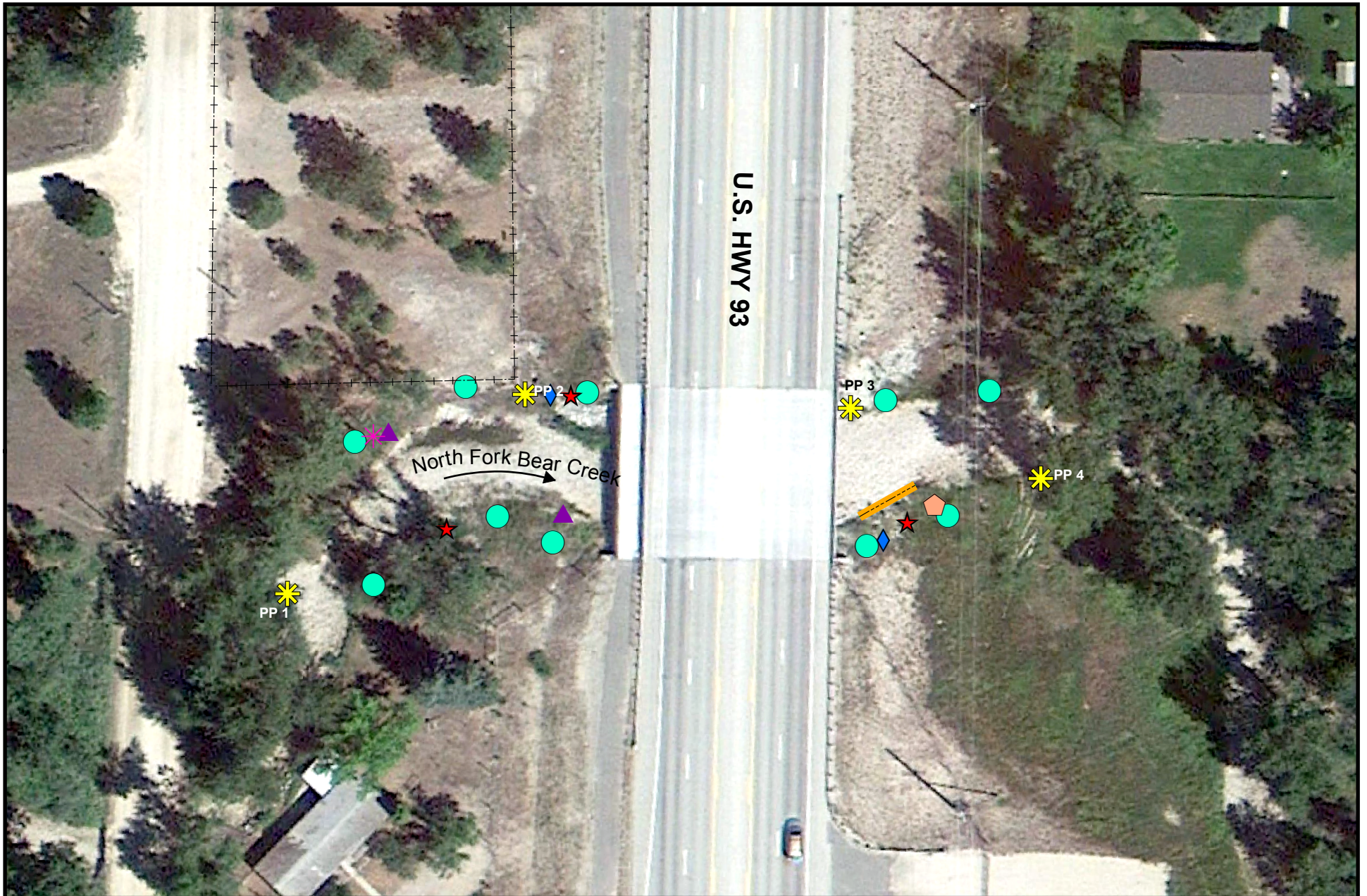
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Appendix A

Project Site Map

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



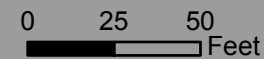
Legend

- Photo Points
- Potentilla recta*
- Centaurea stoebe*

- Leucanthemum vulgare*
- Polygonum cuspidatum*
- Tanacetum vulgare*
- Hypericum perforatum*

Note: *Cirsium arvense* and *Berteroa incana* were observed in trace amounts and were not mapped.

Eroding Bank



**2019 Monitoring
NF Bear Creek**

Figure 2

Date: 10/04/2019

NFBear_features2019.mxd

Appendix B

Project Area Photos

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

PHOTO INFORMATION

PROJECT NAME: North Fork Bear Creek Stream Mitigation Site

DATES: 2013 and 2019 Monitoring Events



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



2019



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



2019



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



2019

PHOTO INFORMATION

PROJECT NAME: North Fork Bear Creek Stream Mitigation Site

DATE: 2013 and 2019 Monitoring Events



2013



2019

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



2013



2019

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



2013



2019

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

PHOTO INFORMATION

PROJECT NAME: North Fork Bear Creek Stream Mitigation Site

DATE: 2013 and 2019 Monitoring Events



2013



2019

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



2013



2019

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



2013



2019

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

DATE: 2013 and 2019 Monitoring Events



2013



2019

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



2013



2019

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



2013



2019

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

Appendix C

2013 – 2019 Comprehensive Plant Species List

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

Comprehensive list of plant species observed at the North Fork Bear Creek Stream Mitigation Site from 2013 through 2019.

| Scientific Name | Common Name | WMVC Indicator Status* | Duration | Scientific Name | Common Name | WMVC Indicator Status* | Duration |
|--|-----------------------------|------------------------|----------|------------------------------------|----------------------------|------------------------|----------|
| <i>Achillea millefolium</i> | Common Yarrow | FACU | P | <i>Melilotus officinalis</i> | Yellow Sweet-Clover | FACU | A/B/P |
| <i>Agropyron cristatum</i> | Crested Wheatgrass | UPL | P | <i>Mentha arvensis</i> | American Wild Mint | FACW | P |
| <i>Agrostis gigantea</i> | Black Bent | FAC | P | <i>Myosotis laxa</i> | Bay Forget-Me-Not | OBL | A/B/P |
| <i>Agrostis scabra</i> | Rough Bent | FAC | P | <i>Nasturtium officinale</i> | Watercress | OBL | P |
| <i>Alopecurus aequalis</i> | Short-Awn Meadow-Foxtail | OBL | P | <i>Osmorhiza occidentalis</i> | Sweet-cicely | UPL | P |
| <i>Alnus incana</i> | Speckled Alder | FACW | P | <i>Pascopyrum smithii</i> | Western-Wheat Grass | FACU | P |
| <i>Alyssum alyssoides</i> | Pale Alyssum | UPL | A/B | <i>Penstemon procerus</i> | Pincushion Beardtongue | FAC | P |
| <i>Amelanchier alnifolia</i> | Saskatoon Service-Berry | FACU | P | <i>Penstemon sp.</i> | Beardtongue | N/A | P |
| <i>Anaphalis margaritacea</i> | Pearly-Everlasting | FACU | P | <i>Peritoma serrulata</i> | Rocky Mountain Beeplant | FACU | A |
| <i>Antennaria parvifolia</i> | Nuttall's Pussytoes | UPL | P | <i>Phalaris arundinacea</i> | Reed Canary Grass | FACW | P |
| <i>Aster sp.</i> | Aster | N/A | A/P | <i>Phleum pratense</i> | Common Timothy | FAC | P |
| <i>Bassia scoparia</i> | Mexican-Fireweed | FAC | A | <i>Picea pungens</i> | Blue Spruce | FAC | P |
| <i>Berteroa incana</i> | Hoary False-Alyssum | UPL | A/B/P | <i>Pinus ponderosa</i> | Ponderosa Pine | FACU | P |
| <i>Bromus diandrus</i> | Ripgut Brome | UPL | A/P | <i>Poa compressa</i> | Flat-Stem Blue Grass | FACU | P |
| <i>Bromus inermis</i> | Smooth Brome | UPL | P | <i>Poa palustris</i> | Fowl Blue Grass | FAC | P |
| <i>Bromus tectorum</i> | Cheatgrass | UPL | A | <i>Poa pratensis</i> | Kentucky Blue Grass | FAC | P |
| <i>Camelina microcarpa</i> | Little-Pod False Flax | FACU | A/B | <i>Polygonum cuspidatum</i> | Japanese Knotweed | UPL | P |
| <i>Carex bebbii</i> | Bebb's Sedge | OBL | P | <i>Populus angustifolia</i> | Narrow-Leaf Cottonwood | FACW | P |
| <i>Carex nebrascensis</i> | Nebraska Sedge | OBL | P | <i>Populus balsamifera</i> | Balsam Poplar | FAC | P |
| <i>Carex sp.</i> | Sedge | N/A | P | <i>Potentilla anserina</i> | Silverweed | OBL | P |
| <i>Carex stipata</i> | Stalk-Grain Sedge | OBL | P | <i>Potentilla recta</i> | Sulphur Cinquefoil | UPL | P |
| <i>Centaurea stoebe</i> | Spotted Knapweed | UPL | B/P | <i>Prunella vulgaris</i> | Common Selfheal | FACU | P |
| <i>Cerastium arvense</i> | Field Mouse-Ear Chickweed | FACU | P | <i>Prunus virginiana</i> | Choke Cherry | FACU | P |
| <i>Chamaenerion angustifolium</i> | Narrow-Leaf Fireweed | FACU | P | <i>Pseudoroegneria spicata</i> | Bluebunch Wheatgrass | UPL | P |
| <i>Chenopodium album</i> | Lamb's-Quarters | FACU | A | <i>Pseudotsuga menziesii</i> | Douglas-Fir | FACU | P |
| <i>Cirsium arvense</i> | Canadian Thistle | FAC | P | <i>Ranunculus repens</i> | Creeping Buttercup | FAC | P |
| <i>Cirsium vulgare</i> | Bull Thistle | FACU | B | <i>Ranunculus sp.</i> | Buttercup | N/A | P |
| <i>Cornus alba</i> | Red Osier | FACW | P | <i>Ribes lacustre</i> | Bristly Black Gooseberry | FAC | P |
| <i>Convolvulus arvensis</i> | Field Bindweed | UPL | P | <i>Rosa woodsii</i> | Woods' Rose | FACU | P |
| <i>Coronilla varia</i> | Common Crown-Vetch | UPL | P | <i>Rubus idaeus</i> | Common Red Raspberry | FACU | P |
| <i>Crataegus douglasii</i> | Black Hawthorn | FAC | P | <i>Rubus sp.</i> | Raspberry sp. | N/A | P |
| <i>Crepis tectorum</i> | Narrowleaf Hawksbeard | UPL | A | <i>Rumex acetosa</i> | Garden Sorrel | FAC | P |
| <i>Cynoglossum officinale</i> | Gypsy-Flower | FACU | B | <i>Rumex acetosella</i> | Common Sheep Sorrel | FACU | P |
| <i>Dactylis glomerata</i> | Orchard Grass | FACU | P | <i>Salix amygdaloides</i> | Peach-Leaf Willow | FACW | P |
| <i>Dasiphora fruticosa</i> | Golden-Hardhack | FAC | P | <i>Salix bebbiana</i> | Gray Willow | FACW | P |
| <i>Deschampsia caespitosa</i> | Tufted Hairgrass | FACW | P | <i>Salix drummondiana</i> | Drummond's Willow | FACW | P |
| <i>Elymus canadensis</i> | Nodding Wild Rye | FAC | P | <i>Salix lasiandra</i> | Pacific Willow | FACW | P |
| <i>Elymus glaucus</i> | Blue Wild Rye | FACU | P | <i>Salix sp.</i> | Willow | N/A | P |
| <i>Elymus repens</i> | Creeping Wild Rye | FAC | P | <i>Salsola tragus</i> | Prickly Russian-Thistle | FACU | A |
| <i>Elymus trachycaulus</i> | Slender Wild Rye | FAC | P | <i>Scutellaria galericulata</i> | Hooded Skullcap | OBL | P |
| <i>Epilobium brachycarpum</i> | Panicled Willowherb | UPL | A | <i>Silene latifolia</i> | Bladder Campion | UPL | B/P |
| <i>Epilobium ciliatum</i> | Fringed Willowherb | FACW | P | <i>Silene noctiflora</i> | Night-flowering Catchfly | UPL | A |
| <i>Erigeron compositus</i> | Cutleaf Fleabane | UPL | P | <i>Sinapis arvensis</i> | Corn Mustard | UPL | A |
| <i>Festuca idahoensis</i> | Bluebunch Fescue | FACU | P | <i>Sisymbrium altissimum</i> | Tall Hedge-Mustard | FACU | A/B |
| <i>Galium aparine</i> | Sticky-Willy | FACU | A | <i>Solanum dulcamara</i> | Climbing Nightshade | FAC | P |
| <i>Galium boreale</i> | Northern Bedstraw | FACU | P | <i>Solidago canadensis</i> | Canadian Goldenrod | FACU | P |
| <i>Geranium viscosissimum</i> | Sticky Purple Crane's-Bill | FACU | P | <i>Sonchus arvensis</i> | Field Sow-Thistle | FACU | P |
| <i>Geum macrophyllum</i> | Large-Leaf Avens | FAC | P | <i>Symphoricarpos albus</i> | Common Snowberry | FACU | P |
| <i>Glyceria striata</i> | Fowl Manna Grass | OBL | P | <i>Symphoricarpos occidentalis</i> | Western Snowberry | FAC | P |
| <i>Hieracium umbellatum</i> | Narrowleaf Hawkweed | UPL | P | <i>Symphyotrichum ascendens</i> | Western American-Aster | FACU | P |
| <i>Hordeum jubatum</i> | Fox-Tail Barley | FAC | P | <i>Symphyotrichum laeve</i> | Smooth Blue American-Aster | FACU | P |
| <i>Hypericum perforatum</i> | Common St. John's-Wort | FACU | P | <i>Tanacetum vulgare</i> | Common Tansy | FACU | P |
| <i>Juncus balticus</i> | Baltic Rush | FACW | P | <i>Taraxacum officinale</i> | Common Dandelion | FACU | P |
| <i>Juncus effusus</i> | Lamp Rush | FACW | P | <i>Thalictrum dasycarpum</i> | Purple Meadow-Rue | FACW | P |
| <i>Juncus sp.</i> | Rush | N/A | P | <i>Thlaspi arvense</i> | Field Pennycress | UPL | A |
| <i>Juncus tenuis</i> | Lesser Poverty Rush | FAC | P | <i>Tragopogon dubius</i> | Meadow Goat's-beard | UPL | A/B |
| <i>Lactuca serriola</i> | Prickly Lettuce | FACU | A/B | <i>Trifolium pratense</i> | Red Clover | FACU | B/P |
| <i>Lepidium campestre</i> | Field Pepper-Grass | UPL | A/B | <i>Trifolium repens</i> | White Clover | FAC | P |
| <i>Leucanthemum vulgare</i> | Ox-Eye Daisy | FACU | P | <i>Verbascum thapsus</i> | Great Mullein | FACU | B |
| <i>Lycopus asper</i> | Rough Water-Horehound | OBL | P | <i>Veronica americana</i> | American-Brooklime | OBL | P |
| <i>Medicago lupulina</i> | Black Medick | FACU | A/P | | | | |

* 2016 National Wetland Plant List; Western Mountains, Valleys, and Coast Region (WMVC) (Lichvar *et al.* 2016)

Duration: A=Annual; B=Biennial; P=Perennial; USDA PLANTS Database (2019)

New species identified in 2019 are **bolded**

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

Appendix D

2019 Noxious Weed Species List

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

Weeds observed within the North Fork Bear Creek riparian zone in 2019.

| 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 |

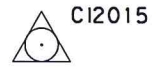
* Based on the MT Department of Agriculture 2019 Noxious Weed List

Appendix E

As Built Drawings and Design Schematics

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

| CONTROL TABLE | | | | |
|---------------|------------|------------|----------|-------------|
| PNT# | NORTHING | EASTING | ELEV. | DESCRIPTION |
| CI2015 | 820308.760 | 797947.813 | 3435.224 | MDT AL CAP |
| CG2015 | 819805.449 | 798080.492 | 3436.854 | MDT AL CAP |



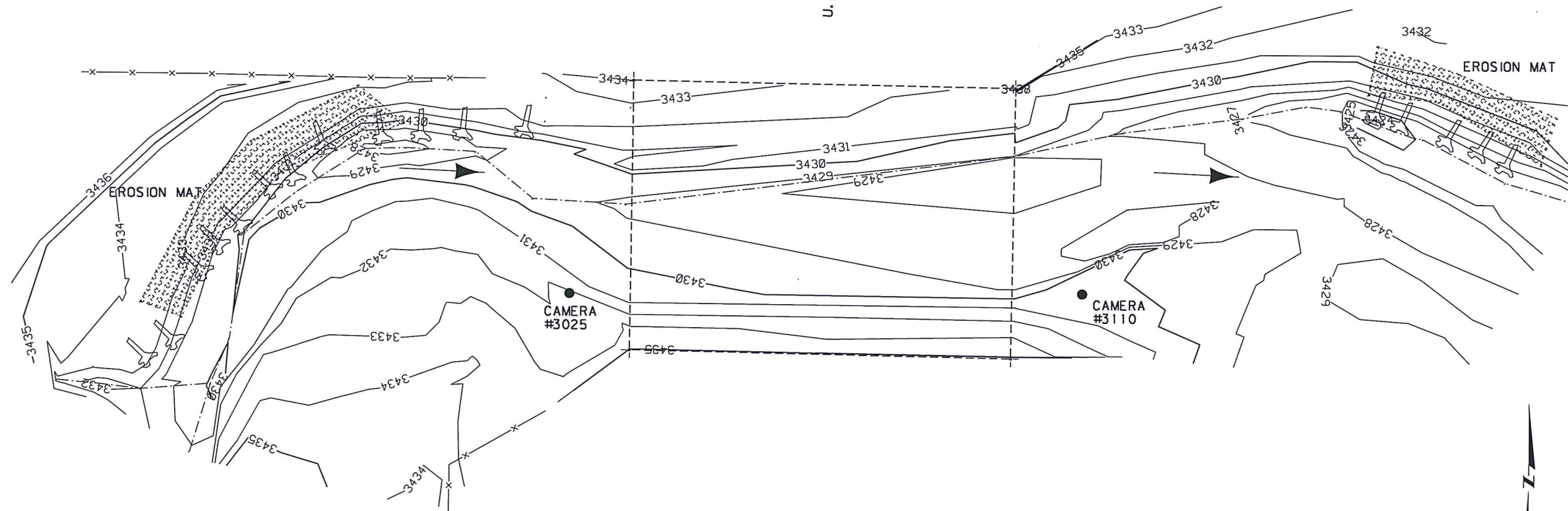
LEGEND



ROOT BALL



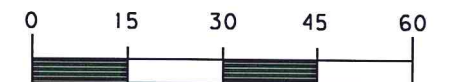
U. S. HWY 93



AS-BUILT TOPOGRAPHIC DRAWING OF THE NORTH FORK OF BEAR CREEK CHANNEL

SURVEYOR NOTES:

1. THIS SURVEY IS BASED ON FOUND MDT ALUMINUM CAPS STAMPED CI2015 AND CG2015 BUT THEY DO NOT HAVE ESTABLISHED MDT COORDS AND ELEVATIONS. THEREFORE LOCAL CONTROL WAS ESTABLISHED FOR THIS SITE WITH TRIMBLE GPS RTK SURVEY AND THE APPROXIMATE ASSUMED ELEVATION AT MDT ALUM CAP CI2015.
2. THE COORDINATES SHOWN HEREON ARE BASED ON MONTANA STATE PLANE GRID



3
2
1

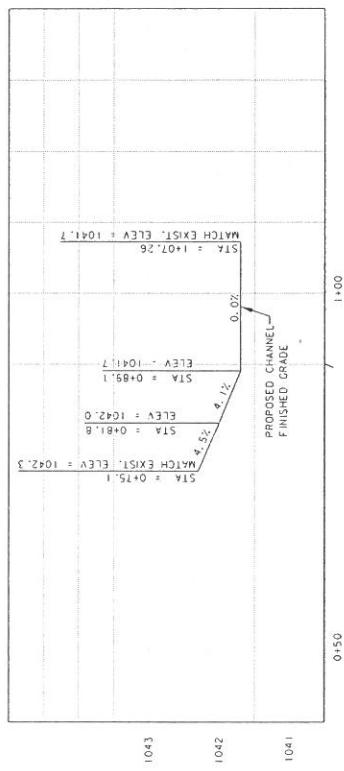
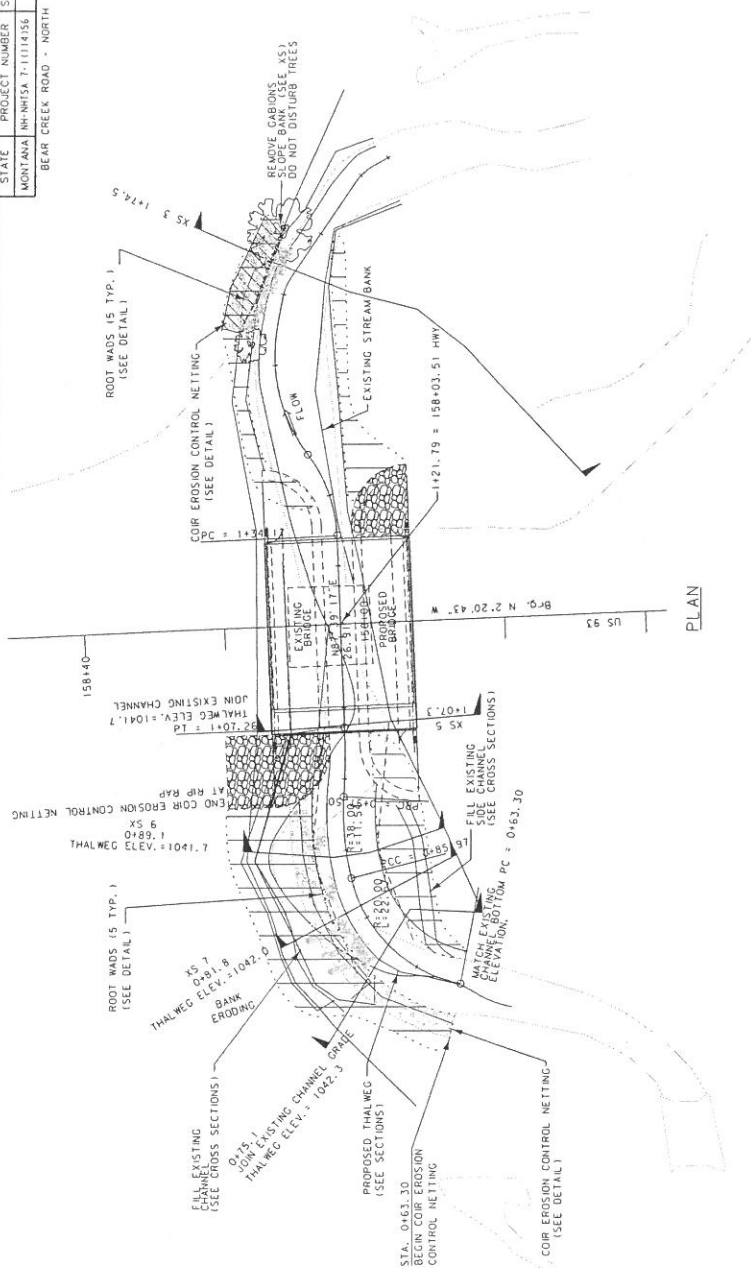
MDT MONTANA DEPARTMENT OF TRANSPORTATION

...NF BEAR CREEK PLAN.dgn
12/9/2013
11:02:51 AM awibe

DESIGNED BY ARNE W
REVIEWED BY
CHECKED BY LARRY R

N.F. BEAR CREEK

MDT STREAM MITIGATION MONITORING SURVEY

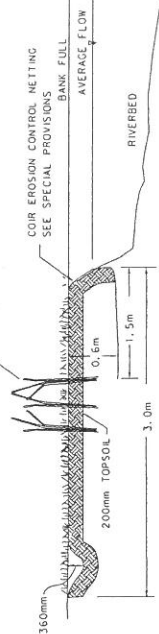


COORDINATE TABLE

| STATION | NORTHING | EASTING |
|---------|-------------|-------------|
| 0+76.03 | 36,218.1167 | 56,132.1603 |
| 0+85.97 | 36,221.2271 | 56,204.3003 |
| 0+91.78 | 36,222.6477 | 56,210.5363 |
| 1+02.39 | 36,222.0482 | 56,221.2141 |
| 1+07.46 | 36,222.2420 | 56,226.0927 |
| 1+10.14 | 36,223.4034 | 56,226.3948 |
| 1+15.61 | 36,223.6668 | 56,222.3869 |
| 1+20.48 | 36,227.4917 | 56,224.3830 |
| 1+25.48 | 36,231.0305 | 56,226.2933 |
| 1+30.48 | 36,230.1936 | 56,227.8178 |
| 1+35.48 | 36,229.8772 | 56,229.1522 |
| 1+40.48 | 36,229.1764 | 56,230.3597 |
| 1+45.48 | 36,218.2584 | 56,304.6191 |
| 1+50.48 | 36,216.0744 | 56,305.8532 |

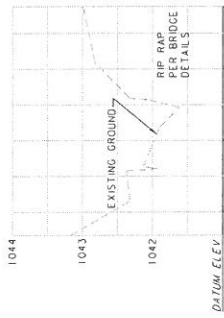
- NOTES:**
- REMOVE ALL EXISTING GABIONS, APPROXIMATE STATION 1+63 TO 1+78, AS DIRECTED BY ENGINEER.
 - INSTALL SIX (6) ROOT WAD STRUCTURES BETWEEN STATIONS 1+63 AND 1+78 AS DIRECTED BY ENGINEER.
 - INSTALL SIX (6) ROOT WAD STRUCTURES BETWEEN STATION 0+66 AND 1+10 AS DIRECTED BY ENGINEER.
 - DO NOT DISTURB EXISTING STUMPS/ROOT WADS NEAR STATION 0+90
 - DO NOT DISTURB TREES IN GABION AREA 1+78



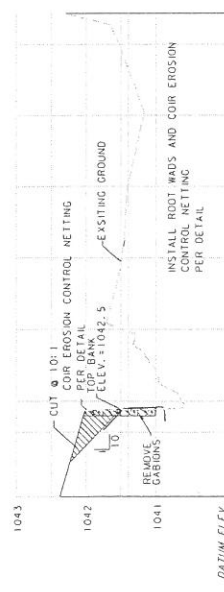


1. SUB EXCAVATE BANKS 0.6 METERS FROM EDGE OF BANK.
2. BACK FILL WITH NATIVE MATERIAL AND 0.2 METERS TOPSOIL.
3. BACK FILL WITH NATIVE MATERIAL AND 0.2 METERS TOPSOIL.
4. WRAP NETTING AND EXTEND 3.0 METERS MIN. FROM BANK EDGE.

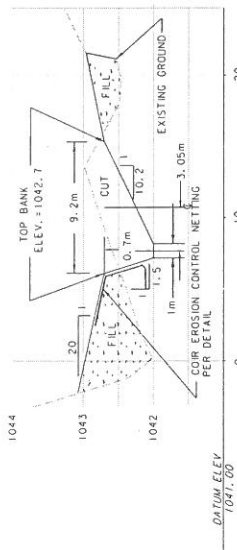
COIR EROSION CONTROL NETTING TYPICAL
N. FORK BEAR CREEK



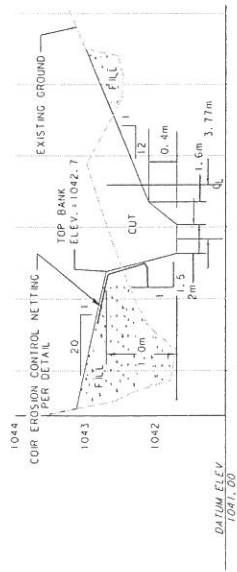
1+07.3



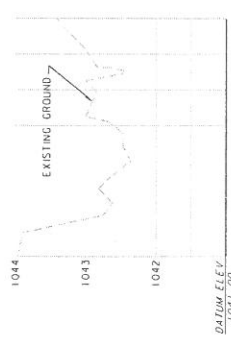
1+74.5



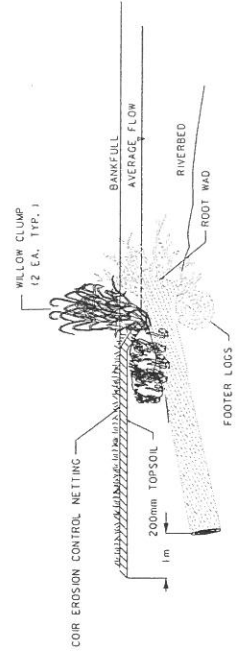
0+81.8



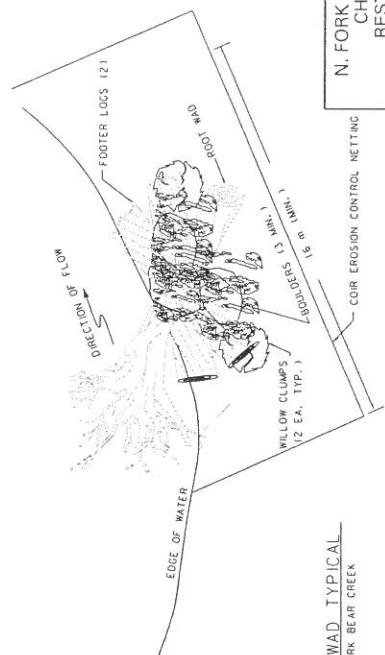
0+89.1



0+75.1



CROSS SECTION



ROOT WAD TYPICAL
N. FORK BEAR CREEK

PLAN

N. FORK BEAR CREEK
CHANNEL
RESTORATION
DETAILS
STA. 158+03
SHEET 2 OF 2
NO SCALE