MONTANA DEPARTMENT OF TRANSPORTATION
STREAM MITIGATION MONITORING REPORT

Foy's Bend Fisheries Conservation Area
Flathead County, Montana

Prepared for:

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December, 2013

MONTANA DEPARTMENT OF TRANSPORTATION

STREAM MITIGATION MONITORING REPORT:

YEAR 2013

Foy's Bends Fisheries Conservation Area
Flathead County, Montana

MDT Project Number: NH-MT 5-3(50) 109F
Control Number: 20380013

SPA# MDT-R1-77-2012
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1.0 INTRODUCTION

As part of construction of the U.S. 93 Kalispell Bypass and other stream impacts associated with transportation projects in the Kalispell Region, Montana Department of Transportation (MDT) modified a portion of the Flathead River at Foy's Bend Fisheries Conservation Area (FCA) in 2013. The purpose of the Foy's Bend stream mitigation project is to create, enhance, restore, and maintain permanent, naturally self-sustaining, native, or native-like stream and riparian habitat. The project is designed to protect the functional values of riparian lands, floodplains, wetlands, and uplands for the benefit of fish and wildlife habitat, water quality, floodwater retention, groundwater recharge, open space, aesthetic values, and environmental education. The project will be utilized to provide compensatory mitigation for stream impacts associated with transportation projects including the Kalispell Bypass in the Missoula District.

Specific objectives of the Foy's Bend modifications included 6,050 linear feet of riparian buffer and constructing 1,350 linear feet of streambank stabilization utilizing a soil lift and coir fascine. Modification and construction of Foy's Bend, one of the first stream projects implemented by MDT under the new Montana Stream Mitigation Procedures released by the U.S. Army Corps of Engineers (USACE) in 2010, was permitted by USACE permit NWO-2009-01808-MTM on January 16, 2013. Project design details are presented on plan sheets in Appendix E to this report.

This project will assist in creating and enhancing riparian habitat and the broader floodplain associated with the Flathead River that have been subject to human induced activities and provide the eco-region with restored natural habitats. The site had been previously altered for agricultural activities to promote hay production and grazing. It is the intent of the project to:

- Restore the riparian habitats and native plant communities;
- Protect native fish habitat for bull trout and westslope cutthroat trout;
- Create new tree-shrub/riparian stream bank habitat in the general floodplain by replacing the existing hay fields with a variety of woody riparian floodplain vegetation communities;
- Improve Flathead River water quality by stabilizing actively eroding stream banks;
- Improve wildlife habitat in this portion of the Flathead River watershed.

This stream mitigation project is on property owned by Montana Fish, Wildlife, and Parks (FWP). Bonneville Power Administration (BPA) also holds a conservation easement on the property which ensures the property will be protected in perpetuity for fish and wildlife habitat and restricts activities that would negatively impact the conservation values of the property. The FWP has prepared a management plan for the property that further ensures the preservation of these riparian communities that develop within the site.

Specifications of the USACE permit (NWO-2009-01808-MTM) include monitoring of the on and off-site stream mitigation areas for five years following channel reconstruction to determine streambank stability and the success of riparian vegetation establishment.

Quantitative success criteria include:

1) **Riparian Buffer Success** will be achieved when woody and riparian vegetation becomes established, and noxious weeds do not exceed 5% cover within the riparian buffer areas. Any area within the creditable buffer area disturbed by the project construction must have at least or greater than 50% aerial cover of beneficial plant species by the end of the monitoring period.

   a. **Vegetation Success** will be achieved where combined aerial cover of riparian and streambank vegetation communities is greater than or equal to 70% and Montana State-listed noxious weeds do not exceed 5% cover, subject to the woody standards listed below.

   b. **Woody Plants** - Planted trees and shrubs will be considered successful where they exhibit 50% survival after five years.

2) **Bank Restoration Success** will be achieved based upon the rate of erosion encountered during the monitoring period, and will be based upon the assessed proper functioning condition assessment utilization Pritchard, D. et.al. Riparian Management Guide TR1737-15 "A User's Guide to Assessing Proper Functioning Condition and the Supporting Science for Lotic Areas" 1998. The rate of erosion will be determined through the installation of bank pins upon the completion of streambank work, and will be measured annually for a period of 5-years and/or until such time as the bank stabilizes vegetatively.

   a. Rates of success will be determined by the following ratings:

      i.) Rate of ≤ 0.5 feet of erosion annually - Functioning*

      ii.) Rate of ≤ 1.0 foot of erosion annually - Functioning*

      iii.) Rate of ≤ 1.5 feet of erosion annually - Functioning at Risk*

      iv.) Rate of ≥ 3 feet of erosion annually - Functioning at Risk or not Functioning*

      v.) Rate of > 5 feet or more of erosion annually - Not Functioning**

   b. Ratings for the streambank will be based upon the Proper Functioning Condition ratings that determine if the area is supporting a healthy and stable bank area adjacent to the stream as derived from the ratings found in Pritchard (1998) for a determination of the following -

i.) **Functioning** - Supporting a healthy and stable bank area adjacent to the river

ii.) **Functioning at Risk** - One or more functions of the streambank are adjusting to changes in the design within the reach area, and the area may be trending either towards lower or higher functionality, but more monitoring and/or adaptive management may be needed so that it can support a healthy and stable bank area in the future.

iii.) **Not Functioning** - Measurements of the functions indicate that the site is not achieving functional goals and is not supporting a healthy and stable bank reach that may be trending toward further degradation.

*If the rate of bank erosion is greater than 1 to 2 feet per year due to natural erosive actions, adaptive management will take place.

**If the rate of bank erosion is greater than 3 feet or more due to a single force of nature, such as an ice jam or a significant flood event beyond the normal riverine processes, this will be considered a major force event and restoration actions may not occur.

3) **Vegetation along the river bank** will be considered successful when banks are vegetated with a majority of deep-rooting riparian plant species having root stability indices greater than or equal to 6 (subject to 1.a and 1.b above).

Additional monitoring requirements include

4) **Weed Control** will be based upon annual monitoring of the site to determine weed species and degree of infestation within the site, and control measures based upon the monitoring results will be implemented by MDT in cooperation with FWP to minimize and/or eliminate the intrusion of Montana State Listed Noxious weed species within the site.

This report includes the results of the first year monitoring of the Foy's Bend FCA stream mitigation site. The report provides the results of vegetation and streambank erosion monitoring, survey results of a restored streambank along the Flathead River, photo-documentation of the project site, and maps indicating the endpoints of riparian belt transects, streambank surveys, vegetation communities, and noxious weeds.

2.0 SITE LOCATION

The project is located in Sections 26, 27, 34, and 35, Township 28 North, Range 21 West, Flathead County, Montana (Figure 1). The project is located within the boundaries of Watershed #4 - Flathead River Basin, approximately 2 miles southeast of Kalispell on the FWP-owned Foy's Bend FCA property. The project site is approximately 245 acres.

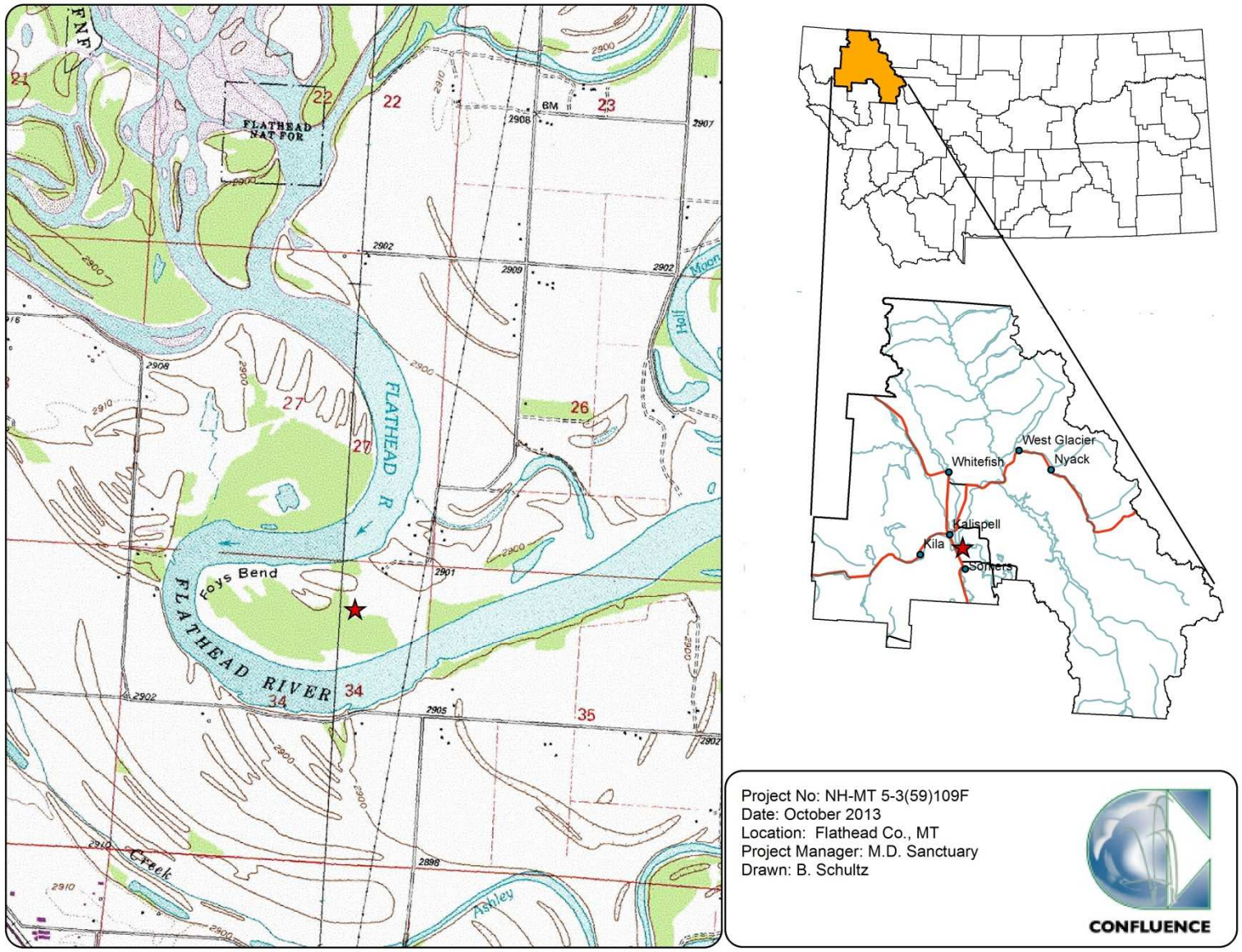


Figure 1. Project location of Foy's Bend Fisheries Conservation Area stream mitigation site.

3.0 MONITORING METHODS

Monitoring field crews visited the project site on September 11-13, 2013 while survey crews visited the site on September 22, 2013. The following data were collected at the Foy's Bend Creek stream mitigation site:

3.1. Vegetation Inventory

A vegetation inventory was accomplished via the use of vegetation transects. Two types of transects were used, riparian vegetation transects within the riparian vegetation exclosures, and one transect along the streambank.

Four riparian belt transects were established; two within fenced exclosures that were planted with woody shrubs, and two within fenced exclosures not planted with riparian shrubs. GPS points were logged at belt transect endpoints, and each endpoint of the riparian transects was marked with a t-post and flagging to allow for relocation during subsequent monitoring events. Field data collection at each transect included aerial percent cover of total vegetation, woody vegetation, and noxious weeds across a 25 foot wide belt centered on the transect line.

One vegetation transect inventory was conducted along the restored streambank. Data collection included aerial percent cover of total vegetation, woody vegetation, and noxious weeds along a 10 foot wide belt along the entire 1350-foot length of the reconstructed streambank.

3.2. Streambank Vegetation Composition

To assess the contribution of streambank vegetation to streambank stability, the streambank vegetation transect was used to document dominant species presence and to compile a comprehensive list of all species present on the bank. This list was assessed against the USFS bank stability rating for known plants (Winward 2000).

3.3. Woody Plant Survival Inventory

The project area was visually inspected to document survival rates of woody vegetation plantings. The inspection included recording the total number of live and dead woody plantings observed along each row of planted shrubs.

3.4. Noxious Weed Inventory

The project site was visually inspected to document the presence of noxious weeds. All noxious weed infestations were mapped on aerial photography, with species, and extents noted. Any isolated occurrences of noxious weeds were noted but not mapped as an infestation.

3.5. Streambank Performance

Thirteen streambank pins were installed along the top of the reconstructed stream bank to enable measurement of bank retreat rates. Bank pins were installed approximately 100 feet apart along the 1350 foot length of the bank.

3.6. Fascine Inspections

All fascines installed along the river bank were inspected to determine whether they were still in place, have shifted, or have been washed away. MDT will be notified if any fascines are deemed failing or at risk of failure.

3.7. Fencing Inspections

All fencing placed by MDT was inspected for damage or wear. If any fencing was determined to be damaged or needing maintenance, it was photographed and noted. MDT was notified of any significant fencing damage.

3.8. Photo-Documentation

The project site was photographed from several locations to document vegetation establishment and stream bank conditions within the project site. All sites selected for photo-documentation were recorded on field maps with headings noted to allow for repetition during subsequent monitoring years.

3.9. Wildlife Documentation

Wildlife use of the project reach was documented by creating a list of all bird, mammal, and herpetile species observed during the site visit. Wildlife species were identified through visual observation, scat, tracks, and observation of nests, burrows, dens, feathers, etc.

3.10. Project Area Mapping

Dominant vegetation communities within the project area were mapped on aerial photos to document vegetative establishment within the fenced exclosures.

4.0 RESULTS

4.1. Riparian and Streambank Vegetation Inventory - Belt Transects

The four riparian belt transects assessed for vegetation success included a 274 foot transect in exclosure #2, a 425 foot transect in exclosure #6, a 230 foot transect in exclosure #8, and a 275 foot transect in exclosure #18. The 25 foot belt width for all riparian transects was centered on the transect alignment. Two of the riparian transects, T1 and T2, were located in exclosure areas that were planted with woody species per the mitigation plan. One riparian transect, T3, was located in an exclosure that was not planted with woody vegetation, and that did not have existing woody vegetation prior to mitigation. The final riparian transect, T4, was located in an exclosure that was not planted with woody vegetation, and had significant naturally occurring woody vegetation prior to mitigation. The streambank transect (transect #5) was 1350 feet long and ran parallel to the Flathead River along the length of the reconstructed river bank.

Table 1 presents the vegetation cover results for the four riparian transects and single streambank transect. Transect locations are presented on Figures 2 and 3 in Appendix

A. Species composition data for each of the five vegetation transects is presented in Appendix C.

Table 1. Percent cover of vegetation transects at the Foy's Bend stream mitigation site, 2013.

Belt Transect	Transect Type	Length (ft.)	Total % Vegetation Cover
Transect 1 (Exclosure 2)	Riparian	274	100
Transect 2 (Exclosure 6)	Riparian	425	100
Transect 3 (Exclosure 8)	Riparian	230	100
Transect 4 (Exclosure 18)	Riparian	275	100
Transect 5	Streambank	1350	63

For the purposes of determining comprehensive vegetation cover for comparison against the mitigation performance standards, the four riparian belt transects were each considered to be representative of one or more of the 18 riparian exclosure areas, based upon their pre-treatment condition and mitigation activity. Boundaries for the riparian exclosure areas are presented relative to the transect alignments on Figures 2 and 3 in Appendix A. Riparian exclosure boundaries coded for woody vegetation planting status are presented on Figures 5 and 6 of Appendix A.

Transects T1 and T2 were considered representative of the 14 exclosures planted with woody vegetation. The average vegetation cover for these two transects was assigned to exclosures 1-7, 8, 10, and 13-17. Transect T3 was considered representative of the three exclosures with no woody vegetation, planted or native. The vegetation cover for transect T3 was assigned to riparian exclosures 8, 11, and 12. These three exclosures are intended to promote natural woody vegetation development due to their close proximity to existing stands of aspen and cottonwood. Transect T4 was located in the lone riparian exclosure (#18) that was not planted but that had significant naturally occurring woody vegetation. This exclosure was also unique in that it was established by MTFWP for MDT prior to the project, therefore the vegetation cover from transect T4 was considered to be representative of exclosure 18 only. Table 2 presents each riparian exclosure, its area in acres, and its assigned vegetation cover in aerial cover percentage. As shown in Table 2, the area-weighted-average based total vegetation cover for all of the riparian exclosure areas on the project site is 100%.

The streambank transect (transect T5) was 1350 feet long and 10 feet in width, covering approximately 0.3 acres. It was aligned parallel and immediately adjacent to the Flathead River bank on the southern boundary of the project area. The area assessed by the streambank transect is that bounded by the streambank and the newly installed streambank fencing, the location of which is illustrated on Figure 4 of Appendix A. As shown in Table 1, total vegetation cover of the streambank transect was 63%, reflecting the substantial bare ground found in that area. Bare ground primarily included areas where recent sediment deposition occurred following the high water event in 2013 and vegetation had yet to establish. Table 3 presents a summary of vegetation cover assessment for the entire mitigation project. When assessed on an area weighted basis, the 100% vegetation cover of the riparian exclosures that comprise 98% of the

project area dominate, and the combined riparian exclosure and streambank vegetation cover is 99% for the project as a whole.

Table 2. Exclosure size (acreage) and total percent riparian cover at the Foy's Bend stream mitigation site, 2013.

Exclosure #	Planted	Acres	Total % Vegetation Cover
1	Yes	0.74	100%
2	Yes	1.06	100%
3	Yes	0.34	100%
4	Yes	0.87	100%
5	Yes	1.20	100%
6	Yes	1.23	100%
7	Yes	0.93	100%
8	No	0.56	100%
9	Yes	1.16	100%
10	Yes	0.67	100%
11	No	0.26	100%
12	No	0.91	100%
13	Yes	0.75	100%
14	Yes	0.89	100%
15	Yes	0.55	100%
16	Yes	0.41	100%
17	Yes	0.34	100%
18	No	1.22	100%
Total		**14.1**	**100%**

Table 3. Area weighted average for riparian and streambank transects at the Foy's Bend stream mitigation site in 2013.

Area Type	Acres	Total % Vegetation Cover
Riparian Exclosure	14.1	100%
Streambank	0.3	63%
Total	14.4	99%

Table 4 is a comprehensive list of plant species identified within the four transects, the restored streambank, and other incidental species observed on site. In 2013, the first monitoring year for the Foy's Bend stream mitigation site, 62 plant species were observed.

Table 4. Comprehensive list of plant species identified at the Foy's Bend stream mitigation site in 2013.

Scientific Name	Common Name
Agropyron sp.	Wheatgrass
Agrostis gigantea	Black Bent
Alnus incana	Speckled Alder
Alopecurus arundinaceus	Creeping Meadow-Foxtail
Aster spp. (purple)	Aster
Bare Ground	Bare Ground
Brassica kaber	Wild Mustrad
Bromus inermis	Smooth Brome
Carex aquatilis	Leafy Tussock Sedge
Carex nebrascensis	Nebraska Sedge
Carex spp.	Sedge
Carex utriculata	Northwest Territory Sedge
Carex vesicaria	Lesser Bladder Sedge
Chamerion angustifolium	Narrow-Leaf Fireweed
Cirsium arvense	Canadian Thistle
Cirsium vulgare	Bull Thistle
Convolvulus arvensis	Field Bindweed
Coreopsis tinctoria	Golden Tickseed
Cornus alba	Red Osier
Crataegus douglasii	Black Hawthorn
Cynoglossum officinale	Gypsy-Flower
Dactylis glomerata	Orchard Grass
Elymus canadensis	Nodding Wild Rye
Elymus repens	Creeping Wild Rye
Epilobium ciliatum	Fringed Willowherb
Equisetum arvense	Field Horsetail
Equisetum hyemale	Tall Scouring-Rush
Hordeum jubatum	Fox-Tail Barley
Juncus compressus	Round-Fruit Rush
Juncus spp.	Rush
Lactuca serriola	Prickly Lettuce
Lemna minor	Common Duckweed
Leucanthemum vulgare	Ox-Eye Daisy
Linaria vulgaris	Butter and Eggs
Medicago lupulina	Black Medick
Medicago sativa	Alfalfa
Melilotus officinalis	Yellow Sweet-Clover
Mentha arvensis	American Wild Mint
Pascopyrum smithii	Western-Wheat Grass
Persicaria spp.	Smartweed
Phalaris arundinacea	Reed Canary Grass
Phleum pratense	Common Timothy
Plantago lanceolata	English Plantain
Poa palustris	Fowl Blue Grass
Poa pratensis	Kentucky Blue Grass
Populus angustifolia	Narrow-Leaf Cottonwood
Populus balsamifera	Balsam Poplar
Populus tremuloides	Quaking Aspen
Prunus virginiana	Choke Cherry
Salix bebbiana	Gray Willow
Salix exigua	Narrow-Leaf Willow
Schoenoplectus acutus	Hard-Stem Club-Rush
Scirpus spp.	Bulrush
Shepherdia argentea	Silver Buffalo-Berry
Solanum dulcamara	Climbing Nightshade
Solidago canadensis	Canadian Goldenrod
Sonchus arvensis	Field Sow-Thistle
Sporobolus airoides	Alkali-Sacaton
Symphoricarpos albus	Common Snowberry
Taraxacum officinale	Common Dandelion
Trifolium pratense	Red Clover
Trifolium repens	White Clover
Verbascum thapsus	Great Mullein

These species occurred on the site within three identified vegetation community types including:

- Type 1, *Phalaris arundinacea/Poa pratensis*
- Type 2, *Populus spp.*
- Type 3 *Carex spp./Typha latipholia*

The vegetation community type for each of the exclosure areas is presented on Figures 5 and 6 in Appendix A.

4.2. Stream Bank Vegetation Composition

Thirty five plants were observed along the restored streambank in 2013 (Table 5). Plant stability ratings (Winward 2000) were assigned to plant species observed along the streambank to help determine overall bank stability. Stability ratings (1-10 scale) indicate a plant's ability to resist erosive forces based on root characteristics. Nineteen of the 35 species observed have stability indices provided by Winward, while the

remaining 16 species do not. Plants observed without a designated plant stability rating score are listed in Table 5 as N/A. Fourteen of the 19 species (74%) with stability indices scored 6 or higher. The dominant species observed along the reconstructed bank was reed canary grass (*Phalaris arundinacea*), which has a stability index of 9.

Table 5. Streambank vegetation species observed in 2013 at the Foy's Bend stream mitigation site.

Streambank Vegetation	NWPL R9 Indicator**	Stability Index
Carex spp.	NL	9
*Phalaris arundinacea**	FACW	9
Cornus alba	FACW	8
Poa palustris	FAC	8
Populus balsamifera	FAC	8
Populus tremuloides	FACU	8
Salix exigua	FACW	8
Scirpus sp.	NL	8
Solidago canadensis	FACU	8
Alnus incana	FACW	7
Equisetum hyemale	FACW	7
Juncus compressus	OBL	7
Juncus spp.	NL	7
Cirsium arvense	FAC	6
Aster sp. (purple)	NL	4
Mentha arvensis	FACW	4
Agrostis gigantea	FAC	3
Bromus inermis	FACE	3
Hordeum jubatum	FAC	2
Bare Ground	NL	1
Chamerion angustifolium	FACU	N/A
Coreopsis tinctoria	FACU	N/A
Epilobium ciliatum	FACW	N/A
Lactuca serriola	FACU	N/A
Medicago lupulina	FACU	N/A
Melilotus officinalis	FACU	N/A
Persicaria sp.	NL	N/A
Phleum pratense	FAC	N/A
Plantago lanceolata	FACU	N/A
Solanum dulcamara	FAC	N/A
Sonchus arvensis	FACU	N/A
Sporobolus airoides	FAC	N/A
Symphoricarpos albus	FACU	N/A
Taraxacum officinale	FACU	N/A
Trifolium pratense	FACU	N/A
Verbascum thapsus	FACU	N/A

*Indicates the most common species.
**Region 9 wetland indicator status, from 2012 National Wetland Plant List.

4.3. Woody Plant Survival Inventory

Cottonwood, aspen, hawthorn, chokecherry, silverberry, snowberry, currant, Wood's rose, alder, dogwood, and willows were observed as planted woody vegetation species. Table 6 indicates an overall 91% survival rate of woody shrubs within the planted exclosures. Only exclosure #2 indicated a shrub survival rate below 80%. Lower survival rates of woody shrub plantings in exclosure #2 may be resulting from herbivory by small mammals such as voles, as this exclosure is subject to similar hydrology and shade as exclosure #1. Continued monitoring of woody vegetation within this exclosure will help determine causes of reduced survival rates.

Table 6. Woody plant survival at the Foy's Bend stream mitigation site in 2013.

Exclosure Number	Planted (Y/N)	Plants Inspected	Surviving Plants	Survival Rate
1	Y	318	305	96%
2	Y	452	318	70%
3	Y	112	103	92%
4	Y	436	423	97%
5	Y	593	575	97%
6	Y	462	389	84%
7	Y	452	400	88%
9	Y	395	362	92%
10	Y	322	313	97%
13	Y	265	247	93%
14	Y	455	434	95%
15	Y	198	192	97%
16	Y	107	103	96%
17	Y	140	138	99%
	Total	**4707**	**4302**	**91%**

4.4. Noxious Weed Inventory

The Foy's Bend field assessment included identification of four Montana State-listed, priority 2B, noxious weeds. Noxious weeds identified within the project area included Canadian thistle (*Cirsium arvense*), field bindweed (*Convolvulus arvensis*), butter and eggs (*Linaria vulgaris*), and houndstongue (*Cynoglossum officinale*). Specific weed infestations were mapped if they covered 5% or more of each riparian exclosure, and are shown on Figure 5 and 6 in Appendix A. Less frequently observed weeds were not included in the maps due to being isolated occurrences. No noxious weeds were observed along the reconstructed river bank. Table 7 provides a weighted average of noxious weed cover across the mitigation site, indicating approximately 2.8% of the mitigation site exhibits noxious weed growth.

Table 7. Weighted average of weed coverage at the Foy's Bend stream mitigation site in 2013.

Exclosure Type	Total Acres	Weed Acres	Total % Weed Cover
Riparian	14.1	0.4	2.8
Streambank	0.3	0.0	0.0
Total	14.4	0.4	2.8

4.5. Streambank Performance

Fourteen bank pins were installed along the enhanced streambank to measure bank retreat rates (locations shown in Figure 4, Appendix A). No erosion was noted along the reconstructed bank in 2013; therefore the surveyed bank profiles provide a baseline for future erosion monitoring. Results of the 14 surveyed bank profiles are provided in Appendix B.

4.6. Fascine Inspections

All fascines installed along the river bank were inspected to determine whether they were still in place, had shifted, or washed away. All fascines remained in place following high water in 2013. Observation of the coir fabric noted some of the fine soils installed within the fabric had washed out, leaving portions of the fabric loose and draping near the toe of the bank. No fascines were noted to be failing or at risk of failing during the site visit.

4.7. Fencing Inspections

One minor fencing issue was identified during the monitoring event. The fence installed around exclosure #9 had a small tear on the north side and has already been repaired. Photographs were taken and the location was recorded using a GPS to allow for follow up inspections.

4.8. Photo-Documentation

The project site was photographed at several locations to document vegetation establishment and stream bank conditions within the project site (Appendix D). All sites selected for photo-documentation were recorded on field maps with headings noted to allow for repetition during subsequent monitoring years. Photos were taken at each bank pin in the upstream and downstream direction, toward the bank, and toward the river to document conditions along the reconstructed river bank.

4.9. Wildlife Documentation

Observed wildlife use of the Foy’s Bend mitigation area included 19 bird and two mammal species. Beaver use of the area included observations of trimmed shrub stems along the western end of the reconstructed stream bank.

Table 8. Comprehensive list of wildlife observed at the Foy's Bend stream mitigation site in 2013.

Common Name	Scientific Name
Birds	
American Crow	*Corvus brachyrhynchos*
American Robin	*Turdus migratorius*
Bald Eagle	*Haliaeetus leucocephalus*
Belted Kingfisher	*Megaceryle alcyon*
Black-billed Magpie	*Pica hudsonia*
Canada Goose	*Branta canadensis*
Great Horned Owl	*Bubo virginianus*
House wren	*Troglodytes aedon*
Mallard	*Anas platyrhynchos*
Marsh Wren	*Cistothorus palustris*
Mourning Dove	*Zenaida macroura*
Northern Flicker	*Colaptes auratus*
Osprey	*Pandion haliaetus*
Red-tailed Hawk	*Buteo jamaicensis*
Ring-necked Pheasant	*Phasianus colchicus*
Song Sparrow	*Melospiza melodia*
Swainson's Hawk	*Buteo swainsoni*
Tree Swallow	*Tachycineta bicolor*
Western Meadowlark	*Sturnella neglecta*
Mammals	
Beaver	*Castor canadensis*
White-tailed Deer	*Odocoileus virginianus*

4.10. Project Area Mapping

Dominant vegetation and weed communities within the riparian exclosures and reconstructed bank were mapped on aerial photographs to document vegetative establishment within upland and riparian zones (Figures 5 and 6, Appendix A).

5.0 COMPARISON OF RESULTS TO PERFORMANCE STANDARDS

Monitoring of the Foy's Bend mitigation site is intended to document whether the reconstructed river bank and riparian enhancement plots are meeting performance standards outlined in the Army Corps 404 permit issued for the project. The first year of monitoring suggests 5 quantitative performance standards are currently being met, while the performance of two additional standards will be monitored in subsequent years (Table 9). Additional requirements including photo documentation of the project site and results of noxious weed surveys have also been included in this annual monitoring report.

Table 9. Performance of the Foy's Bend mitigation site, 2013.

Monitoring Requirement	Type	Parameter	Performance Standard	Status
1	Performance Criteria	Riparian Buffer Success	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	Riparian exclosures exhibit between **70% and 95%** cover of non-noxious weed species
1	Performance Criteria	Riparian Buffer Success	Noxious weeds do not exceed 5% cover within the riparian buffer areas.	**<3%** cover of noxious weeds observed site-wide
1a	Performance Criteria	Vegetation Success	Combined aerial cover of riparian and stream bank vegetation communities is at least 70%	Combined aerial cover of riparian and stream bank vegetation is **99%**
1b	Performance Criteria	Vegetation Success	Planted trees and shrubs must exhibit 50% survival after 5 years	Woody vegetation planted within exclosures has **91%** survival
2a	Performance Criteria	Bank Restoration Success	i.) Rate of ≤ 0.5 feet of erosion annually - Functioning* ii.) Rate of ≤ 1.0 foot of erosion annually - Functioning* iii.) Rate of ≤ 1.5 feet of erosion annually - Functioning at Risk* iv.) Rate of ≥ 3 feet of erosion annually - Functioning at Risk or not Functioning* v.) Rate of > 5 feet or more of erosion annually - Not Functioning**	2013 data provides baseline for future monitoring. **No erosion detected in 2013.**
2b	Performance Criteria	Bank Restoration Success	Pritchard (1998) Lotic Assessment Scores: Functional; Functional-At-Risk; Non-Functional	TBD in monitoring years 3 and 5
3	Performance Criteria	Vegetation along river bank	Majority of plants on the river bank must have root stability indexes of at least 6	**75%** of species observed with root stability ratings scored 6 or higher. Dominant vegetation on stream bank has stability rating of 9.
4	Reporting Requirement	Photo Documentation	Photo document success of restored stream channel and streambank vegetation community development showing distinct positive changes from pre-construction to final monitoring year in comparison with the establishment reference reach	Photo Documentation included in Appendix D
5	Reporting Requirement	Weed Control	Will be based on annual monitoring of the site to determine weed species and degree of infestation within the site, and control measures based on the monitoring results will be implemented by MDT in cooperation with the Flathead County Weed District to minimize and/or eliminate the intrusion of State Listed noxious weed species within the site.	Species and percent cover of noxious weeds included in 2013 Monitoring Report

5.1. Riparian Buffer Success

Vegetation monitoring of the riparian and stream banks indicated 96.4% of disturbed areas had successfully revegetated with desirable species following reconstruction of the bank and installation of the riparian exclosures. Desirable vegetative cover was determined by subtracting the percent of weedy species cover (2.6%) from the total vegetative cover for the site (99%). Performance criteria specify at least 50% of the disturbed areas within the creditable buffer area must be vegetated with non-weedy species; therefore, this criterion is currently being met. The performance criterion for noxious weeds (≤5%) is also currently being met at this project site.

5.1.1. Vegetation Success

Total combined aerial vegetative cover of the riparian exclosures and the reconstructed river bank is currently 99% (100% of the exclosures and 63% of the river bank). Site-wide coverage of weed species is currently 2.8%. The performance criterion for this category specifies ≥70% of the combined riparian and streambank vegetation communities must have vegetative establishment; with less than 5% coverage of weed species, therefore this criterion is currently being met.

5.1.2. Woody Plant Survival

Woody vegetation plantings indicated a survival rate of 91% during the first growing season. The performance criteria states 50% of the woody plants installed must survive five years following construction; therefore, additional monitoring is necessary to meet this criterion. Most planted riparian exclosures had survival rates above 90%. Only riparian exclosure #2 had woody survival rates below 80%.

5.1. Bank Restoration Success

Determination of bank restoration success requires a) monitoring erosion rates over multiple years to determine the functional performance of the bank segment, and b) conducting a Functional Assessment of the reconstructed bank using lotic inventory assessment protocols (Pritchard 1998). No bank erosion was observed in 2013. Bank pins were installed at 14 locations to document any bank retreat rates during subsequent monitoring events. Monitoring results for this performance criterion will be generated in 2014. The Functional Assessment will be performed on the reconstructed stream bank during monitoring years 3 and 5 following completion of the bank reconstruction project.

5.2. Vegetation along Streambank

The vegetation inventory along the reconstructed bank segment identified the majority (74%) of species had stability scores ≥6 when compared to all species with stability scores. The most prevalent species observed along the bank was reed canary grass, covering greater than 50% of the stream banks and having a stability index of 9. These results indicate the performance criterion for streambank vegetation is currently being met one year following completion of the project.

5.3. Weed Control

This monitoring report includes documentation of four noxious weed species within the Foy's Bend mitigation site. Although all planted exclosures had Canadian thistle within them, significant infestations of Canadian thistle and butter and eggs were mapped (Figures 5 and 6, Appendix A) if they covered greater than 5% of the exclosure. Isolated occurrences of houndstongue and field bindweed were also observed, but were not mapped.

Riparian and stream bank vegetation transects indicated the overall site has between 2% and 3% cover of noxious weeds. The most prevalent weed observed was Canadian thistle, which occupied up to 30% of the riparian exclosures. Most of the thistle was growing around the edges of the burlap material placed during woody vegetation planting. MDT in cooperation with MFWP will determine the most appropriate methods to minimize and control the occurrence of noxious weeds within the Foy's Bend FCA site.

5.4. Photo Documentation

Permanent photo monitoring locations were established at 7 locations to document vegetation establishment and site conditions over time. Photo monitoring locations are illustrated in Figures 2-4 in Appendix A and are included in the photo log in Appendix D.

6.0 MANAGEMENT AND DESIGN RECOMMENDATIONS

6.1. Coir Bank Reconstruction Materials

Designs for the reconstructed river bank included placing a layer of coir fabric along the toe of the bank slope to temporarily protect the resloped bank while planted vegetation established. The coir fabric was effective at withstanding erosion along the bank; however, the large gaps between the coir strands allowed some of the fine soils to escape during high flows. Portions of the fabric layer are sagging as a result of these fine materials being stripped from beneath the coir.

Fine soils placed within protective coir may be secured if a second, finer layer of coir fabric is placed between the outer coir layer and the soil. This second layer is often used in bioengineered stream banks to prevent fine soil loss when the bank is submerged. The recommended fabric to achieve this goal is North American Green, product #125-BN. This product includes a fine coir mesh and biodegradable reinforcement twine.

6.2. Beaver Evidence

Evidence of beaver activity was noted near the upstream extent of the reconstructed bank, and included trampled bank vegetation to the edge of the river and several planted woody stems with chew marks. Beaver use in this area may reduce survival rates of planted woody vegetation along the bank. If beavers jeopardize the project's success, management actions may be warranted.

6.3. Thistle Infestations

Riparian exclosures planted with woody species consistently exhibited occurrences of Canadian thistle. The majority of thistle appeared to generate along the edges of the burlap rows and soil within plant pots. Canadian thistle was observed in all exclosures, but was particularly dense (up to 30% cover) in the planted exclosures. Aggressive combat of thistle colonization is recommended to continuously meet the performance criteria for noxious weed cover across the Foy's Bend project site.

6.4. Fence Installation

Fencing around the riparian exclosures was installed very well, with only one minor issue noted. A small gap in the fence was noted on the north side of exclosure #9. Photo documentation by surveying crews indicated this fencing issue has already been repaired. Otherwise, all fencing was in excellent condition.

7.0 LITERATURE CITED

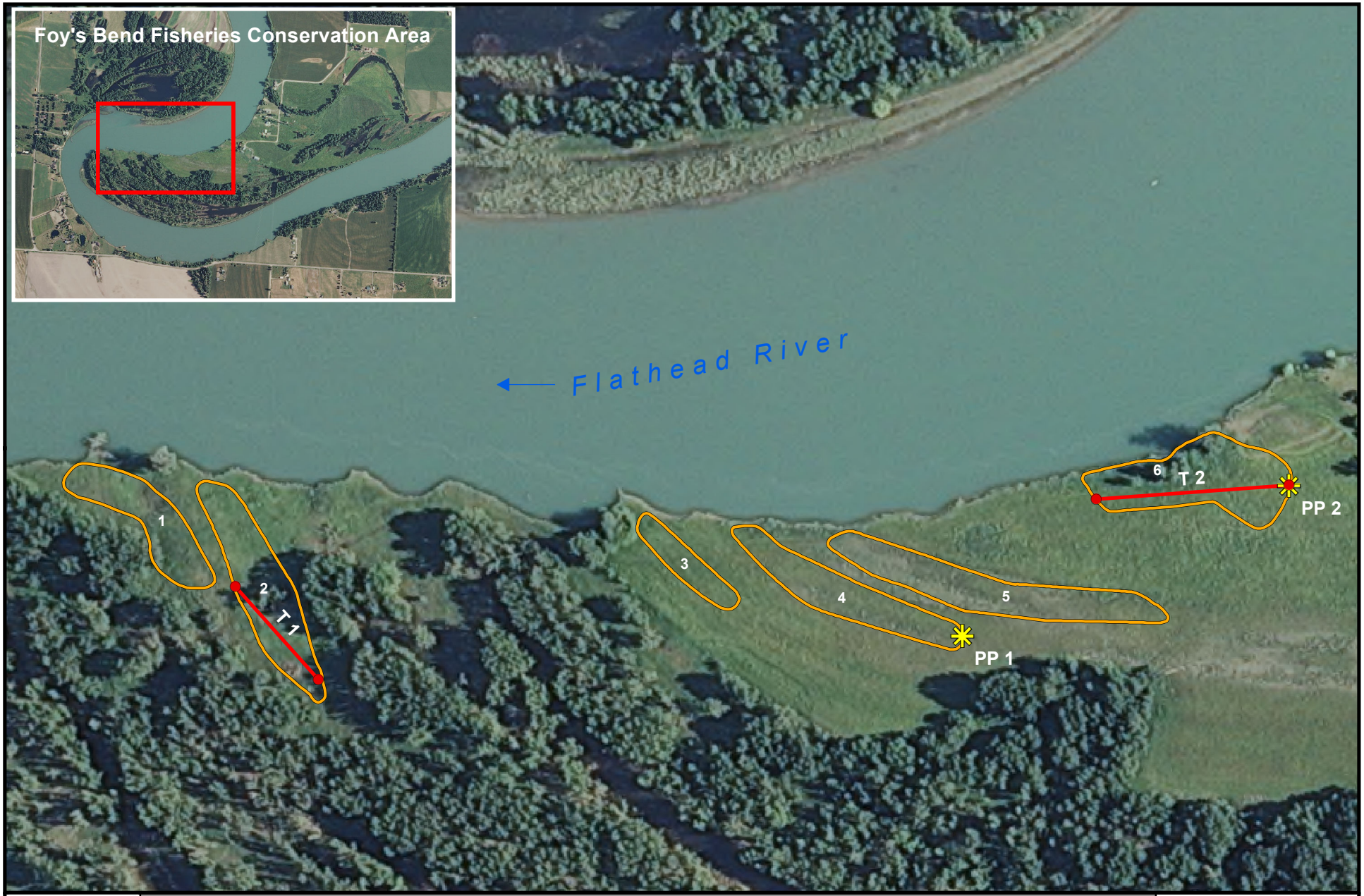
MDT, 2008. Montana Wetland Assessment Method. Helena, Montana.

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

Appendix A

Project Site Maps

MDT Stream Mitigation Monitoring
Foy's Bend Fisheries Conservation Area
Flathead County, Montana



CONFLUENCE
consulting incorporated

Legend

- Photo Points
- Transect Endpoints
- Riparian Transect
- Exclosures

N

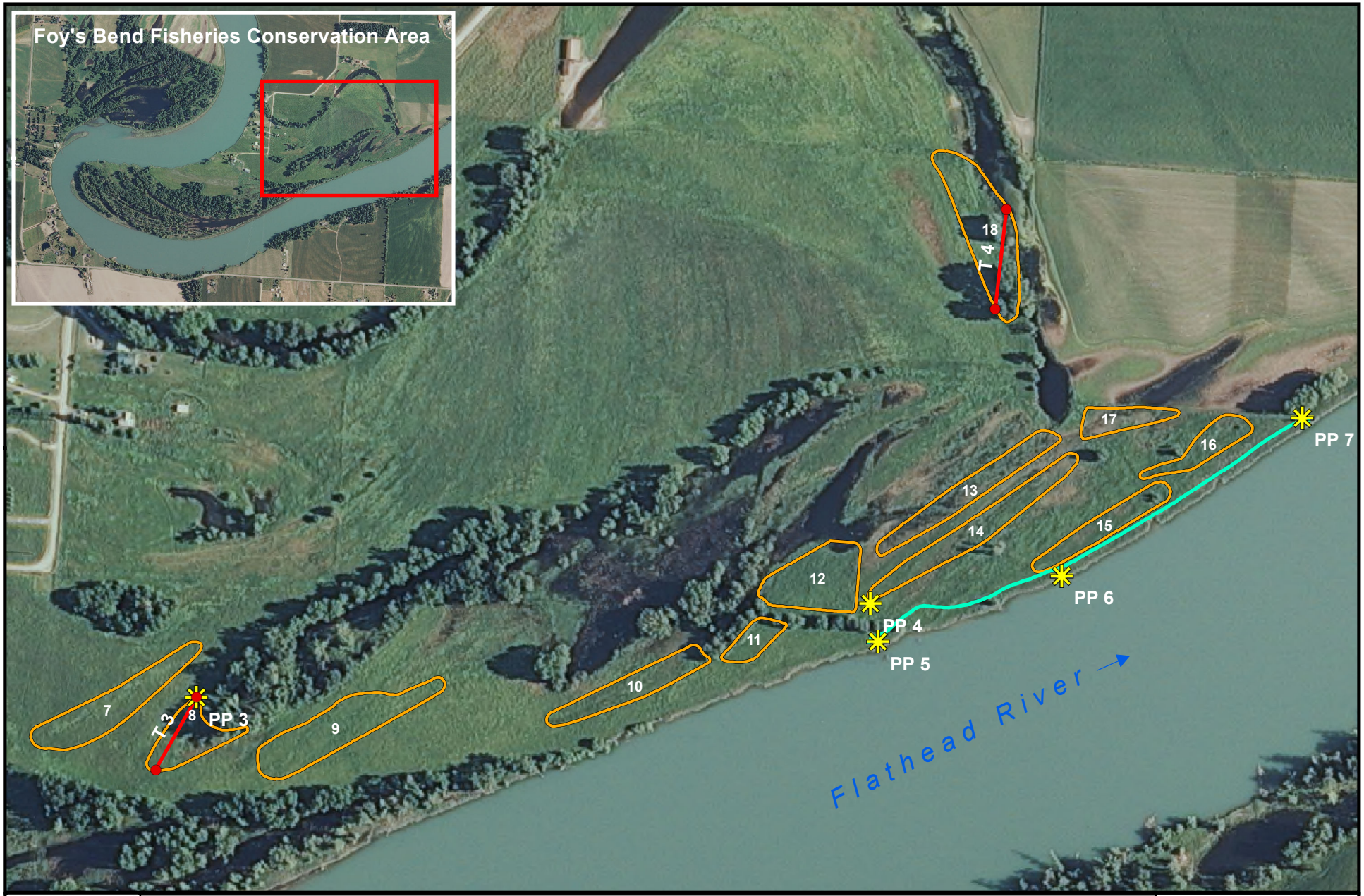
0 100 200 300 400 500 Feet

2013 Monitoring Foys Bend

Figure 2

Date: 12/09/2013

X:/MDT_.007/mains



CONFLUENCE
consulting incorporated

Legend

- Photo Points
- Transect Endpoints
- Riparian Transect
- Streambank Fencing
- Exclosures

N

0 100 200 300 400 500 Feet

2013 Monitoring Foys Bend

Figure 3

Date: 12/09/2013

X:/MDT_.007/mains

CONFLUENCE
consulting incorporated

Legend

- Photo Points
- Exclosures
- Bank Profiles
- Streambank Fencing

N

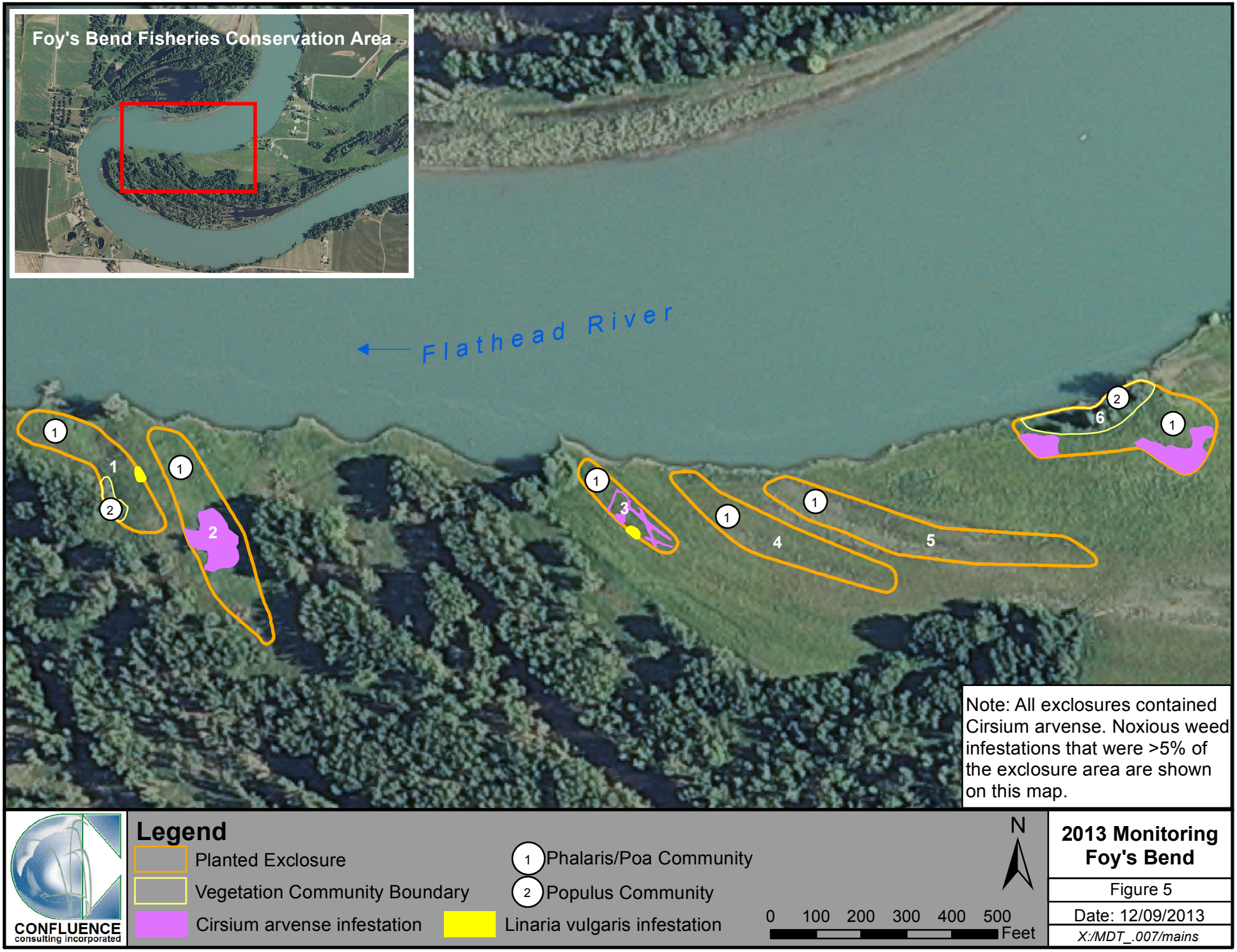
0 100 200 300 Feet

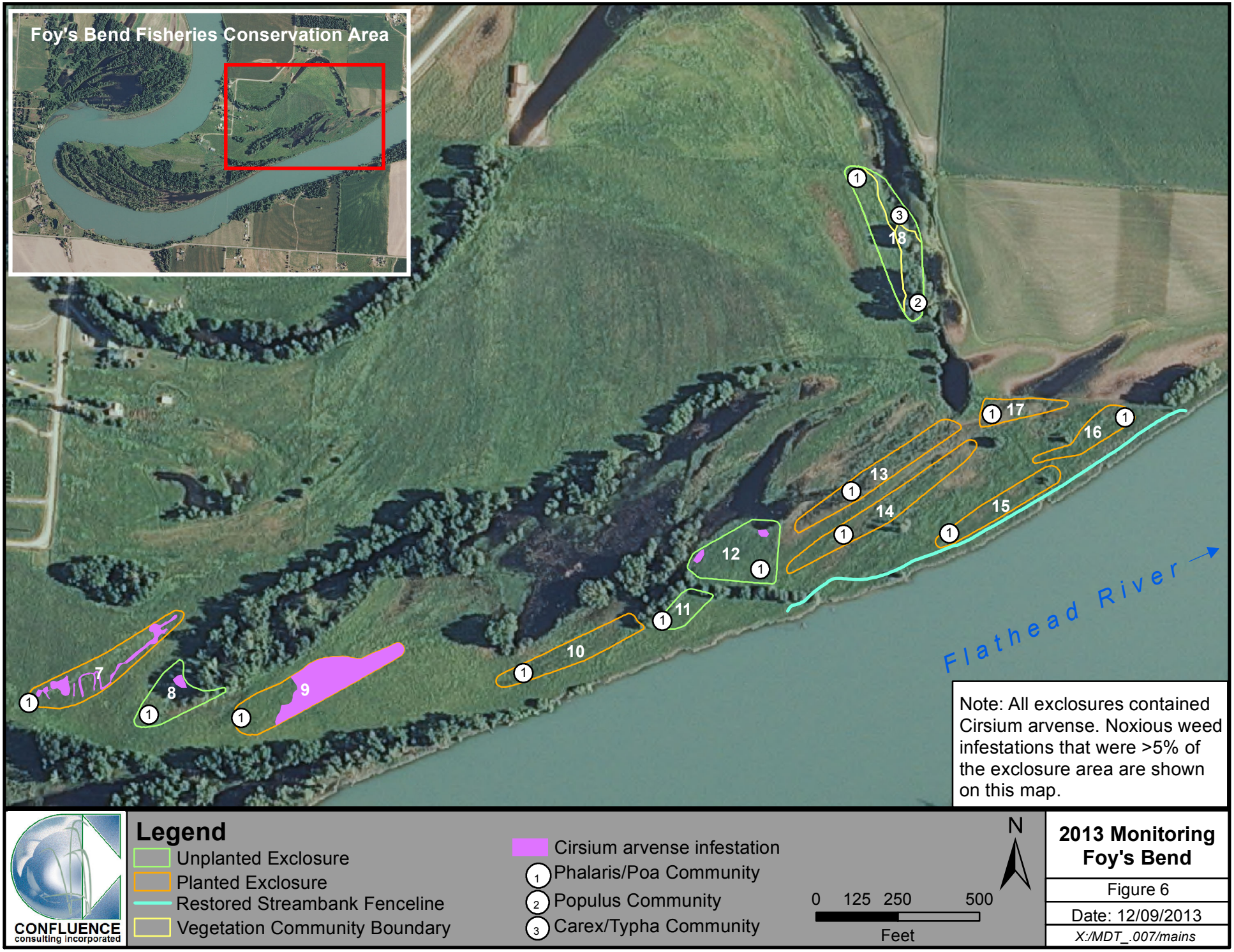
2013 Monitoring
Foys Bend
Bank Profiles

Figure 4

Date: 12/09/2013

X:/MDT_.007/mains

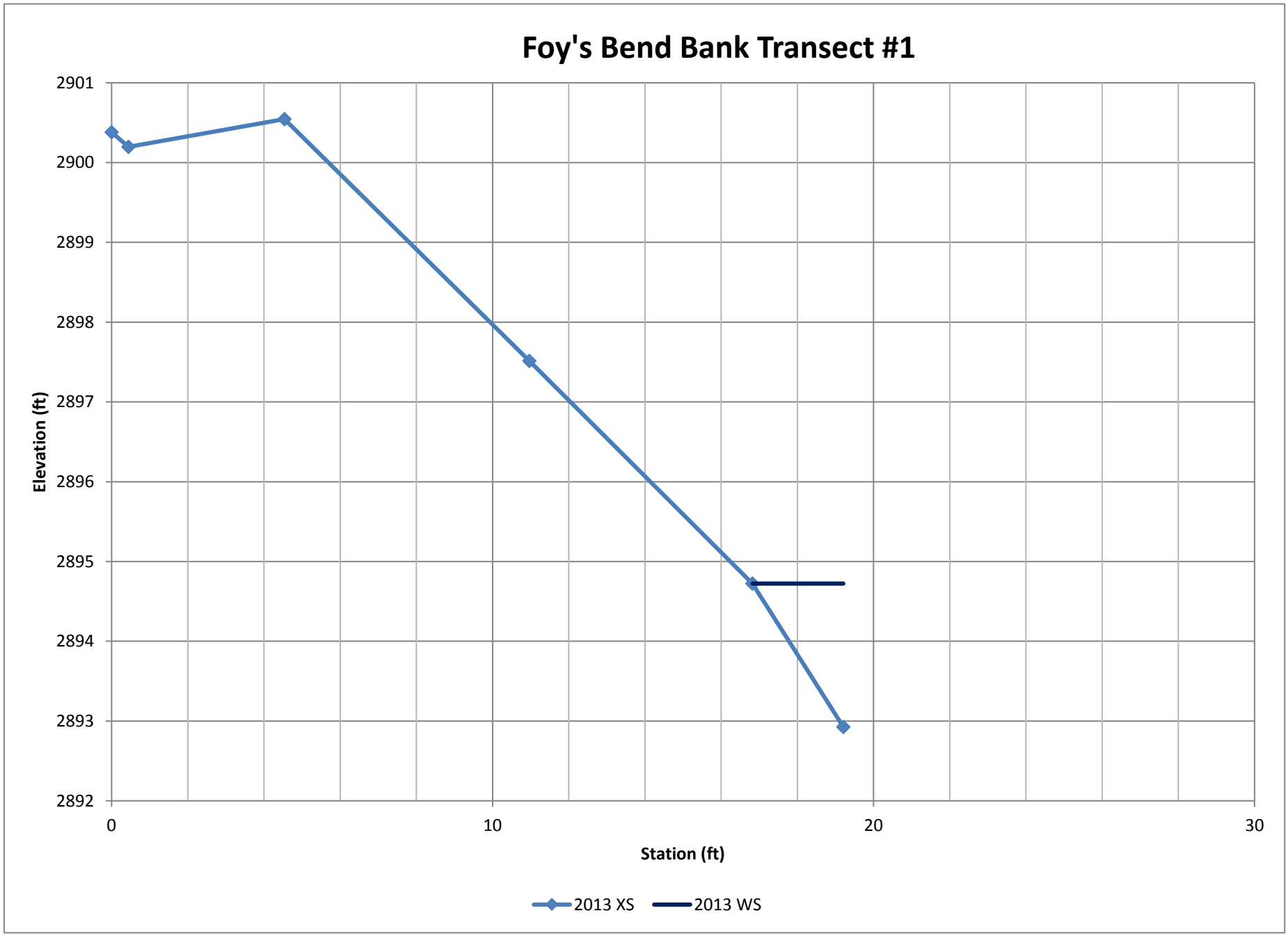

Foy's Bend Fisheries Conservation Area
Flathead River
1
2
3
4
5
6
Note: All exclosures contained Cirsium arvense. Noxious weed infestations that were >5% of the exclosure area are shown on this map.
Legend
Planted Exclosure
Vegetation Community Boundary
Cirsium arvense infestation
Phalaris/Poa Community
Populus Community
Linaria vulgaris infestation
N
0 100 200 300 400 500
Feet
CONFLUENCE
consulting incorporated
2013 Monitoring
Foy's Bend
Figure 5
Date: 12/09/2013
X:/MDT_.007/mains

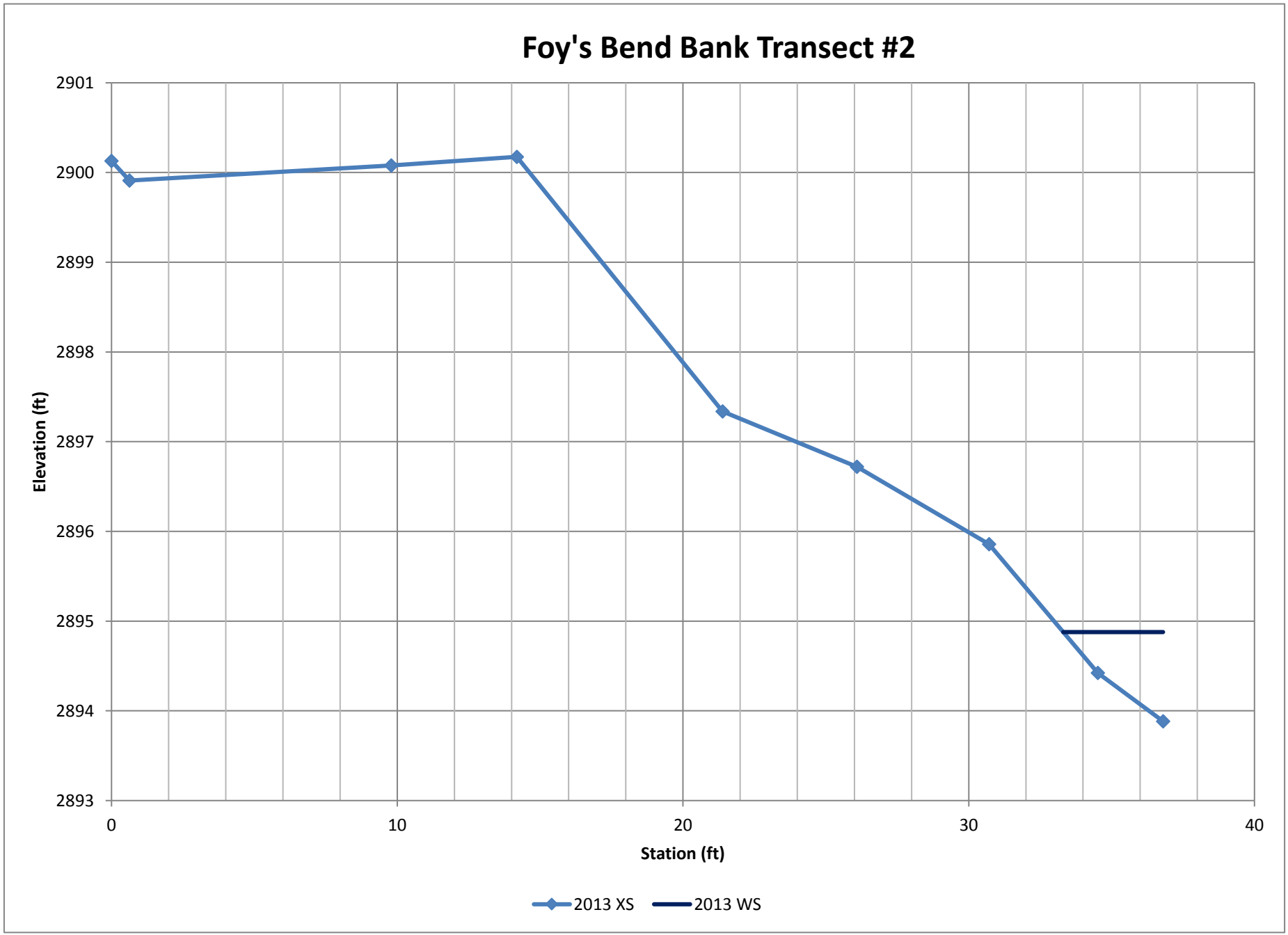

Foy's Bend Fisheries Conservation Area
Flathead River
Note: All exclosures contained Cirsium arvense. Noxious weed infestations that were >5% of the exclosure area are shown on this map.
Legend
Unplanted Exclosure
Planted Exclosure
Restored Streambank Fenceline
Vegetation Community Boundary
Cirsium arvense infestation
1 Phalaris/Poa Community
2 Populus Community
3 Carex/Typha Community
N
0 125 250 500
Feet
CONFLUENCE
consulting incorporated
2013 Monitoring
Foy's Bend
Figure 6
Date: 12/09/2013
X:/MDT_.007/mains

Appendix B

Reconstructed Bank Profile Plots

MDT Stream Mitigation Monitoring
Foy's Bend Fisheries Conservation Area
Flathead County, Montana


Foy's Bend Bank Transect #1
2901
2900
2899
2898
2897
2896
2895
2894
2893
2892
Elevation (ft)
0
10
20
30
Station (ft)
2013 XS
2013 WS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2900
2899
2898
2897
2896
2895
2894
2893
Elevation (ft)
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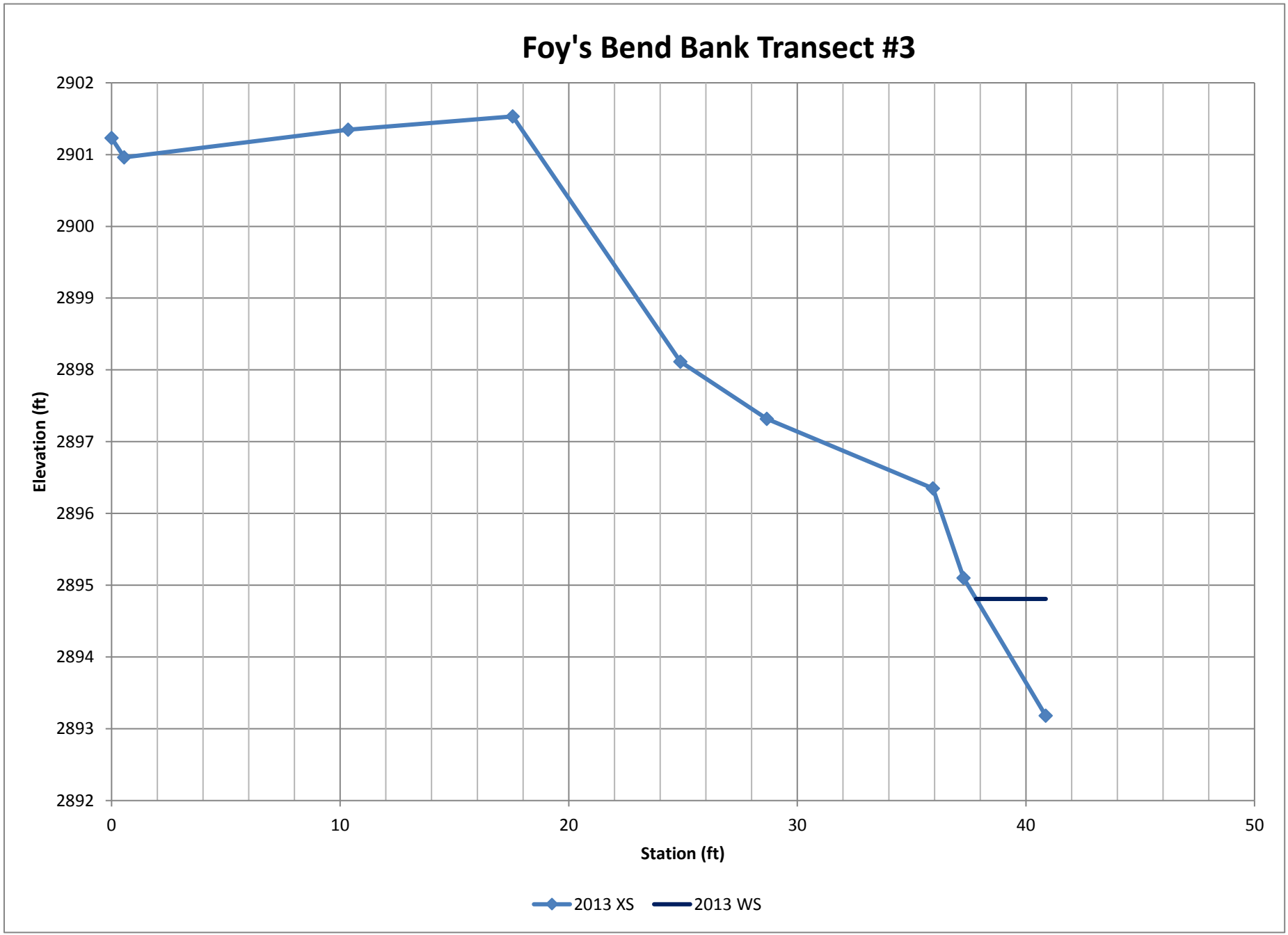
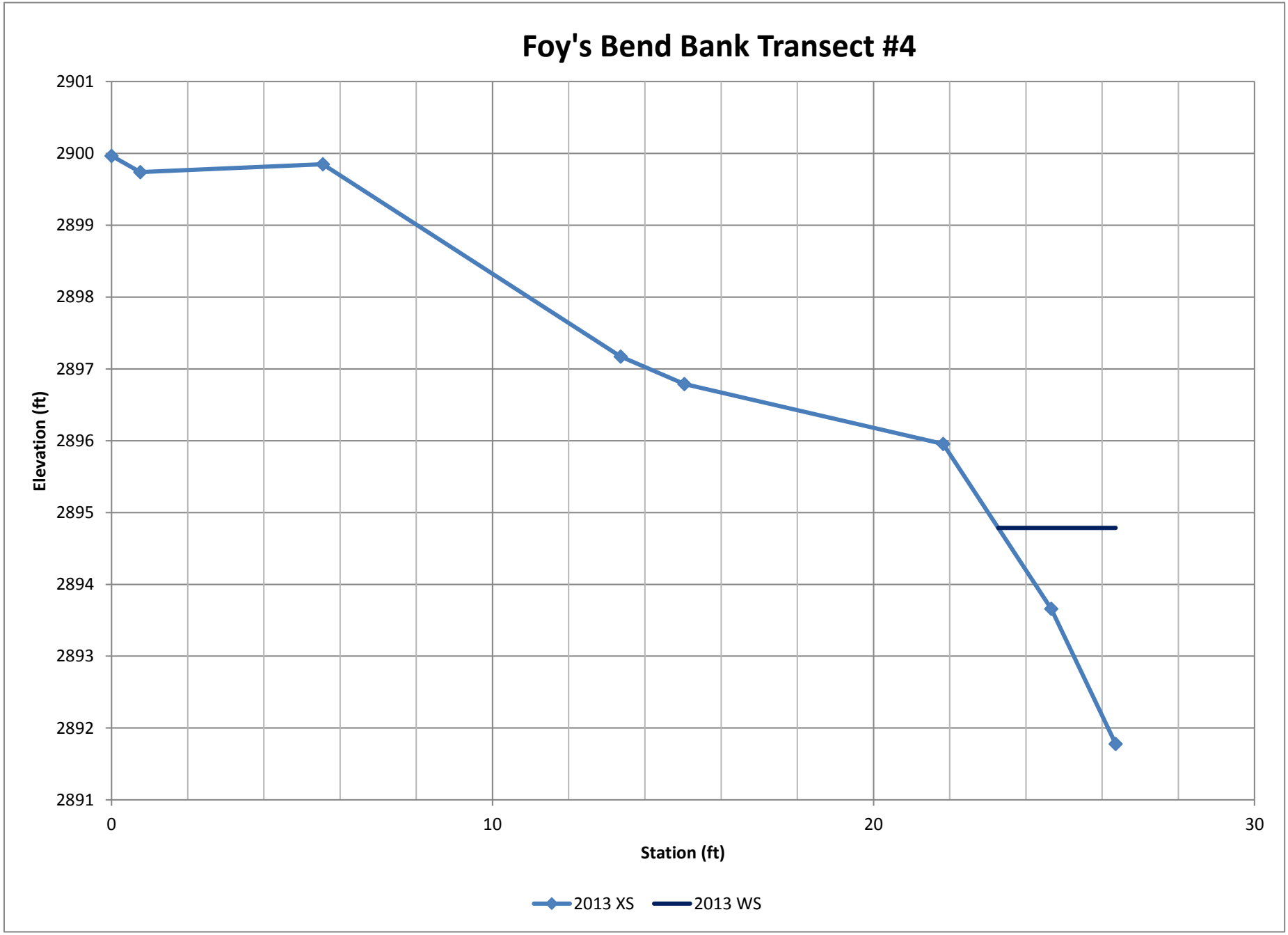
10
20
30
40
Station (ft)
2013 XS
2013 WS


Foy's Bend Bank Transect #3
2902
2901
2900
2899
2898
2897
2896
2895
2894
2893
2892
Elevation (ft)
0
10
20
30
40
50
Station (ft)
2013 XS
2013 WS


Foy's Bend Bank Transect #4
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2896
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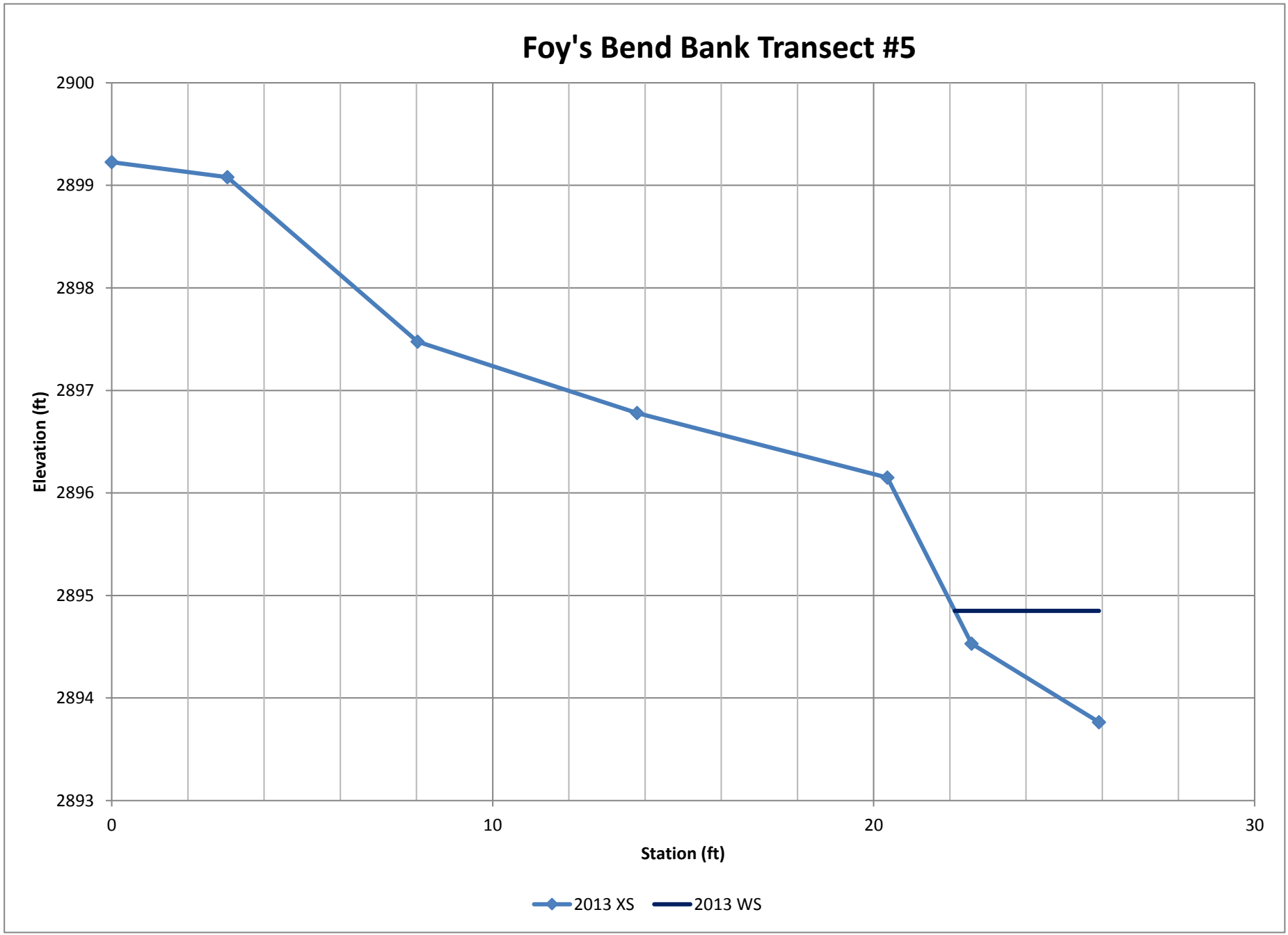
2894
2893
2892
2891
Elevation (ft)
0
10
20
30
Station (ft)
2013 XS
2013 WS


Foy's Bend Bank Transect #5
2900
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2896
2895
2894
2893
Elevation (ft)
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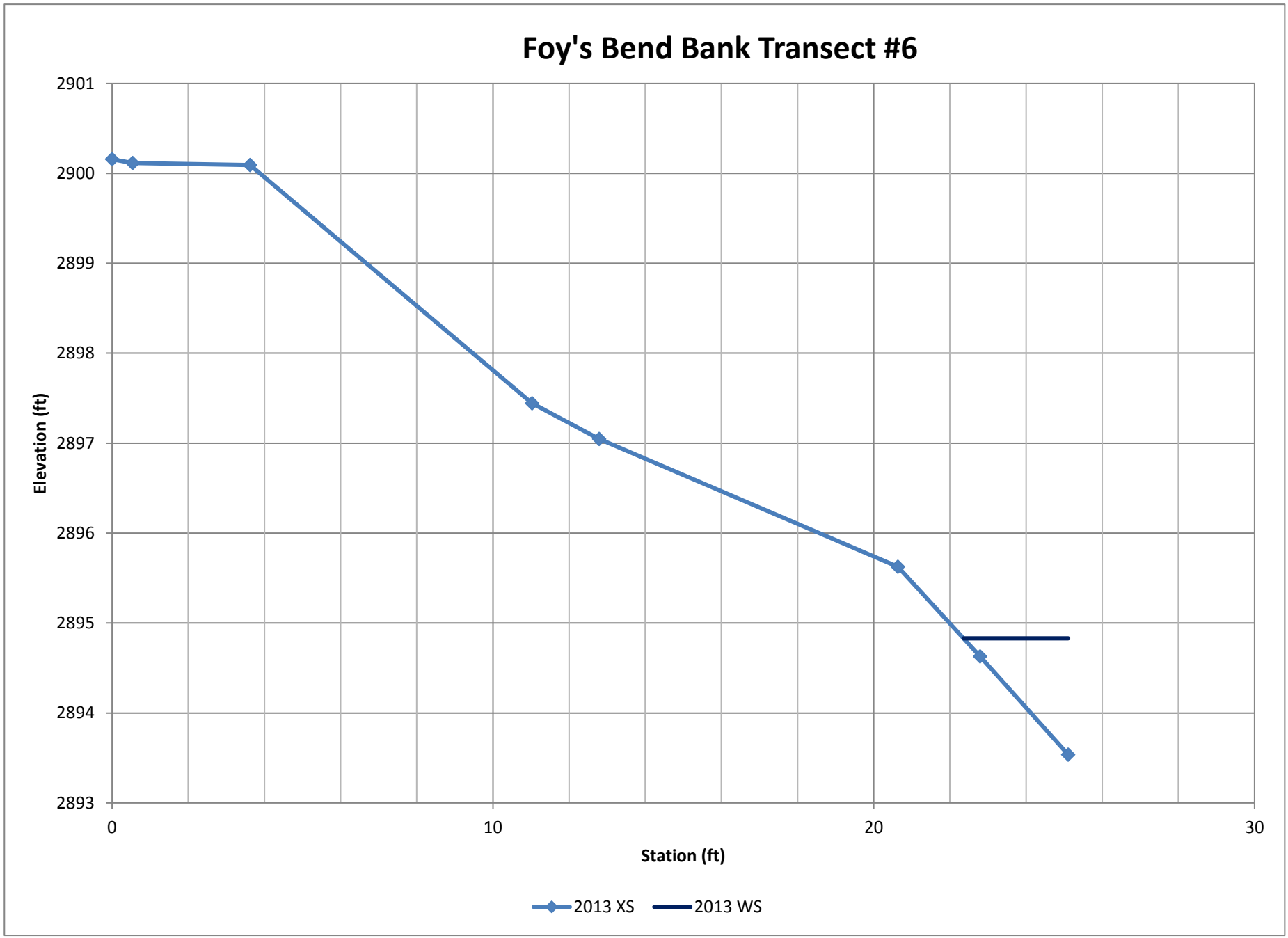
10
20
30
Station (ft)
2013 XS
2013 WS


Foy's Bend Bank Transect #6
2901
2900
2899
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2897
2896
2895
2894
2893
Elevation (ft)
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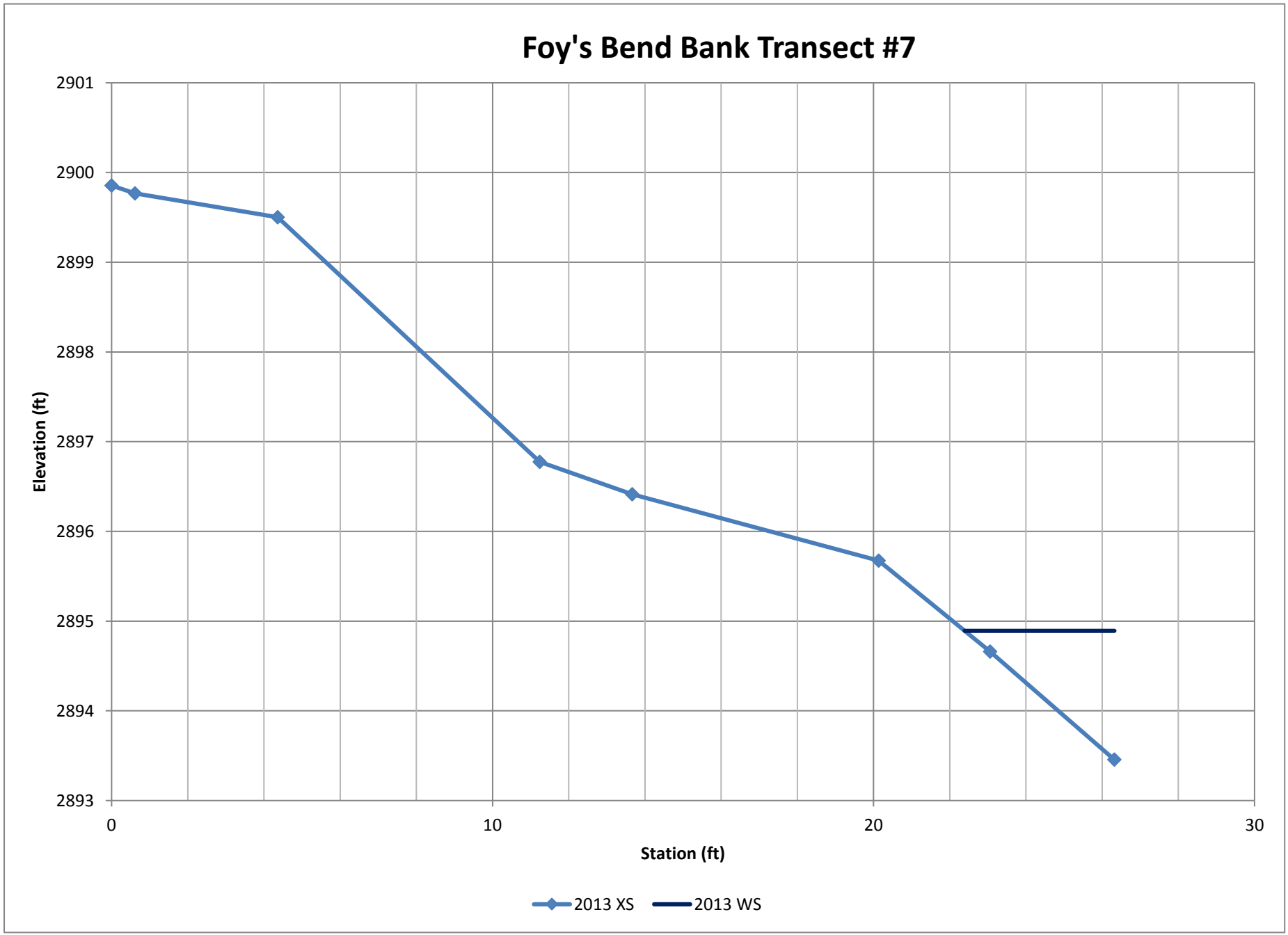
10
20
30
Station (ft)
2013 XS
2013 WS


Foy's Bend Bank Transect #7
2901
2900
2899
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2896
2895
2894
2893
Elevation (ft)
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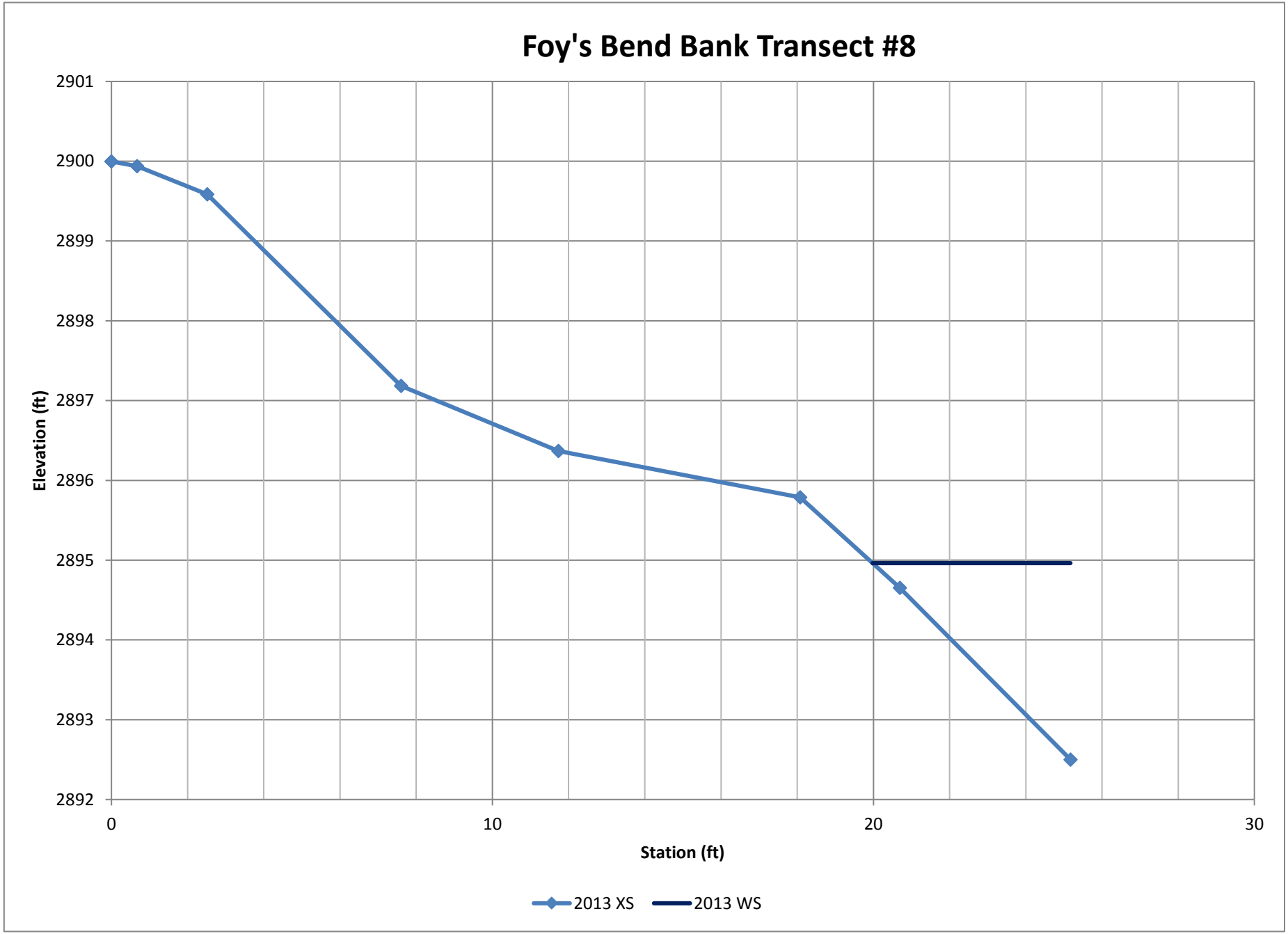
10
20
30
Station (ft)
2013 XS
2013 WS


Foy's Bend Bank Transect #8
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2900
2899
2898
2897
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2895
2894
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2892
Elevation (ft)
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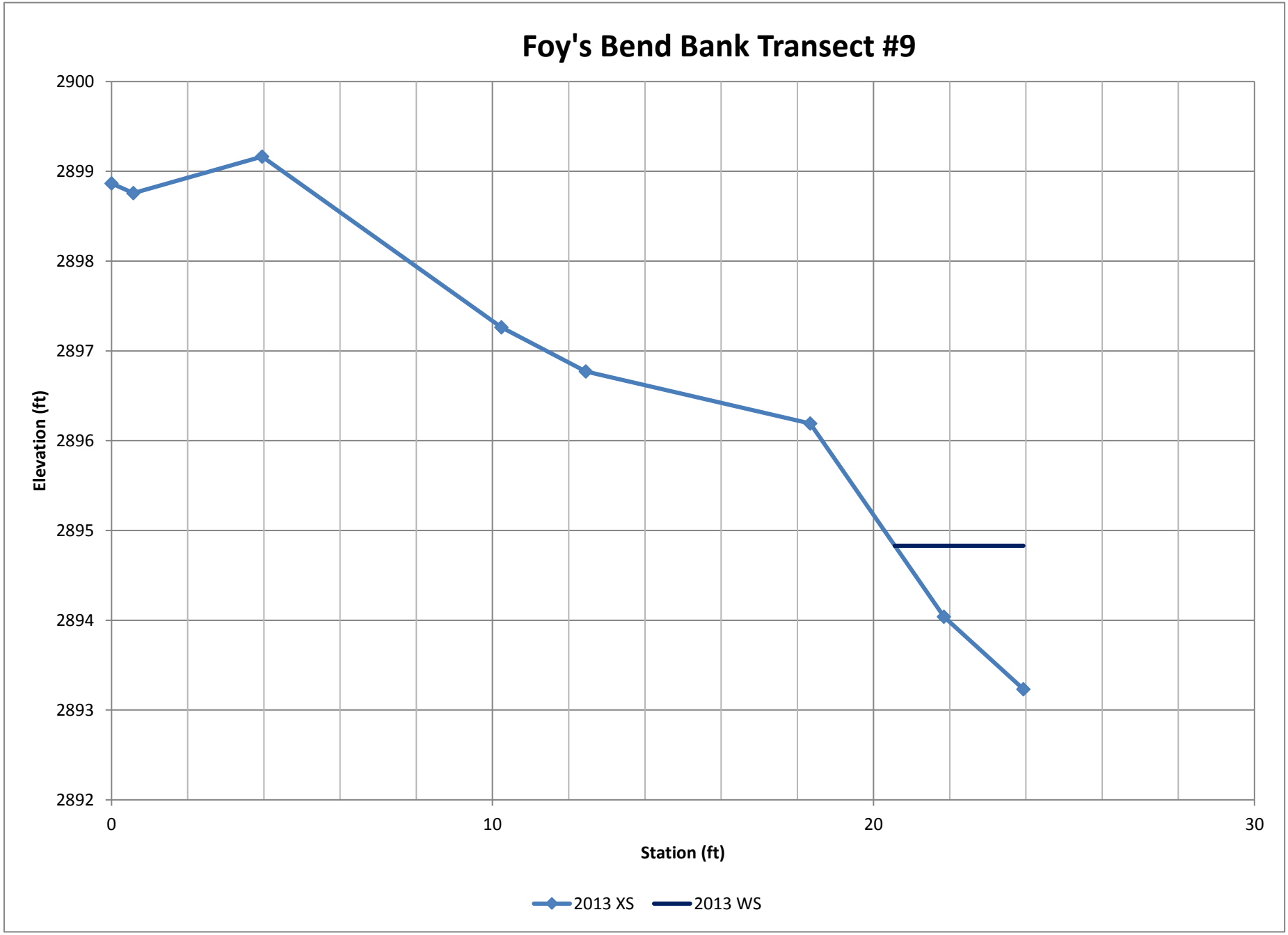
10
20
30
Station (ft)
2013 XS
2013 WS


Foy's Bend Bank Transect #9
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2899
2898
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2895
2894
2893
2892
Elevation (ft)
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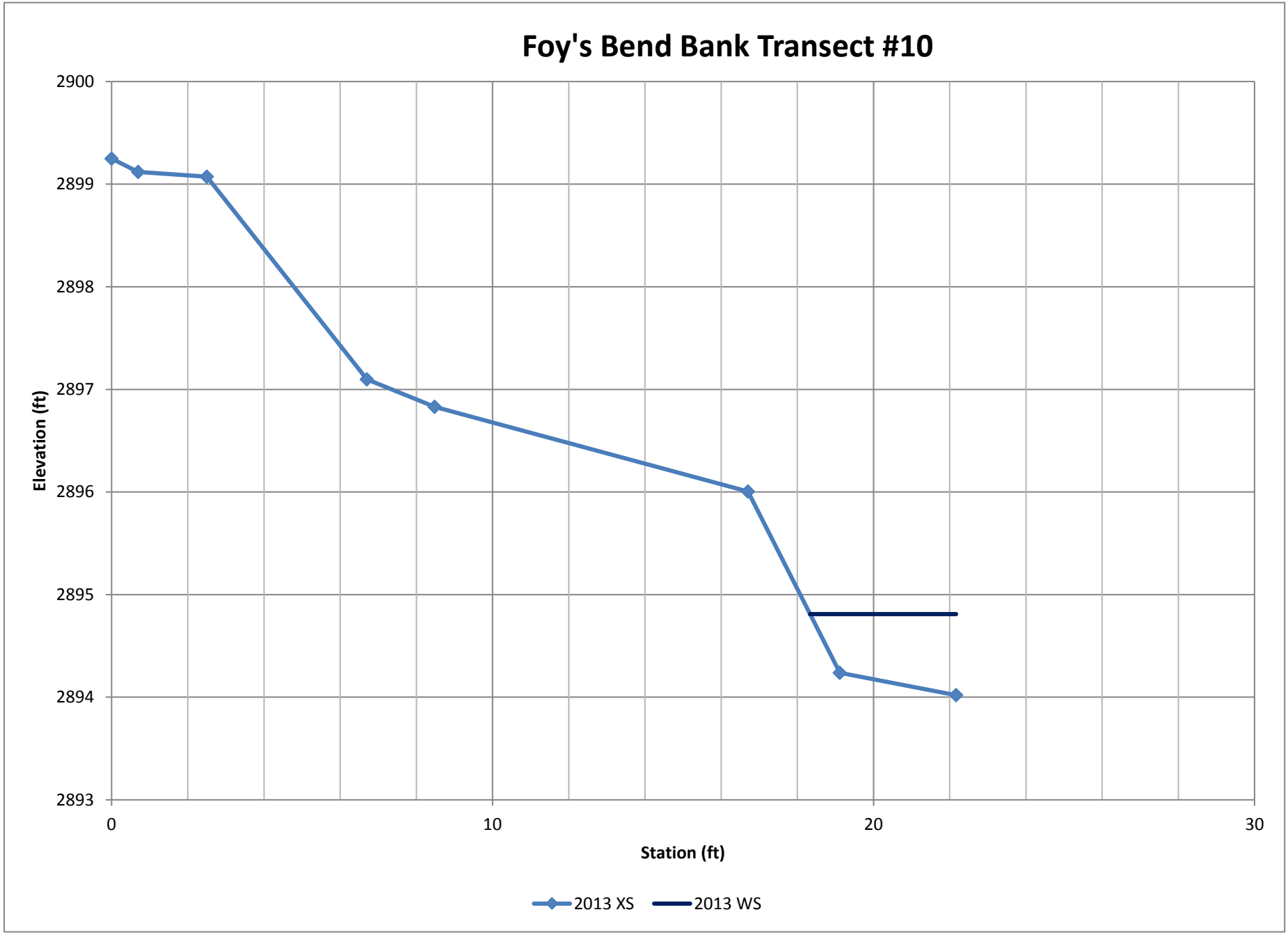
10
20
30
Station (ft)
2013 XS
2013 WS


Foy's Bend Bank Transect #10
2900
2899
2898
2897
2896
2895
2894
2893
Elevation (ft)
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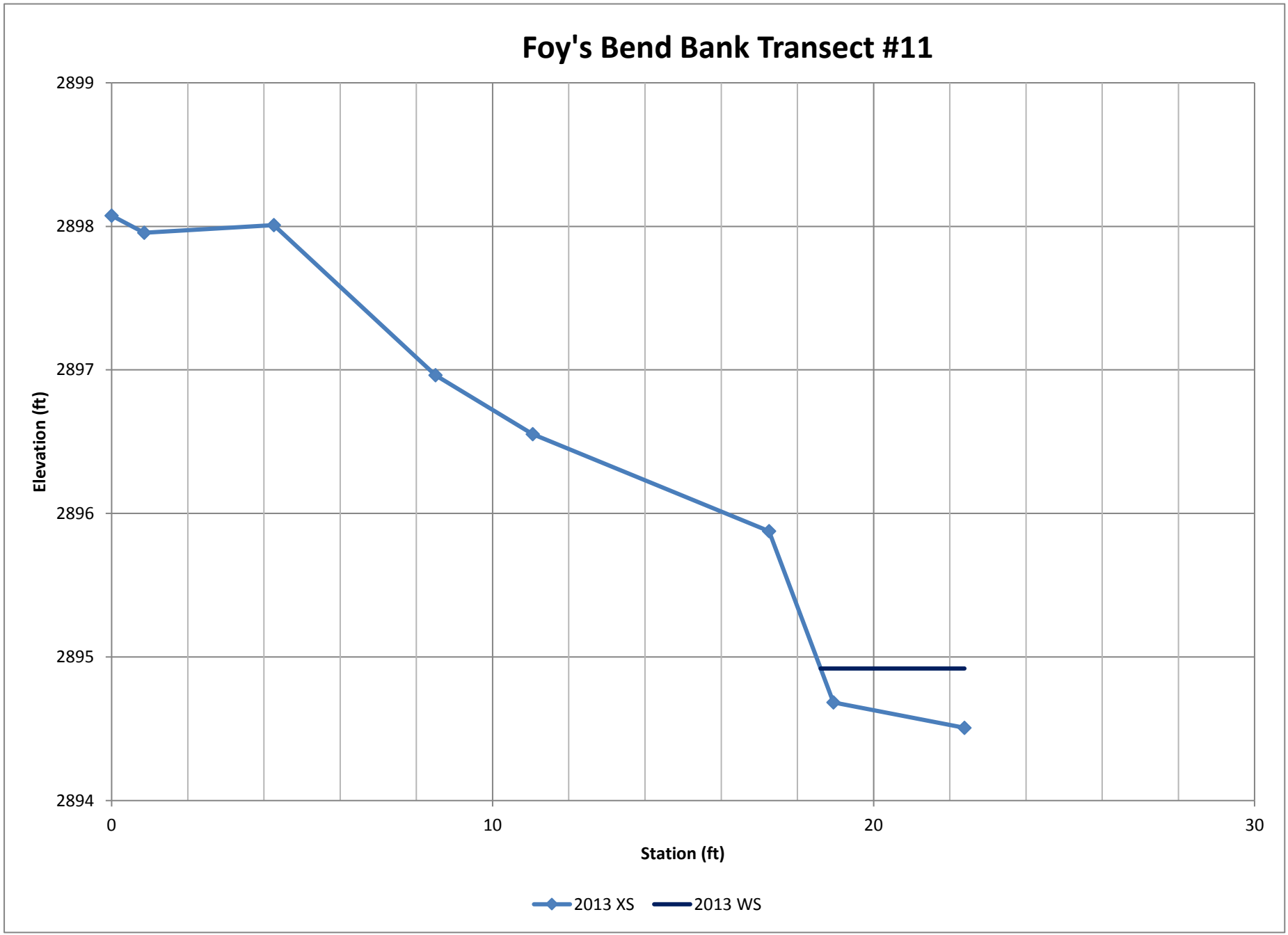
10
20
30
Station (ft)
2013 XS
2013 WS


Foy's Bend Bank Transect #11
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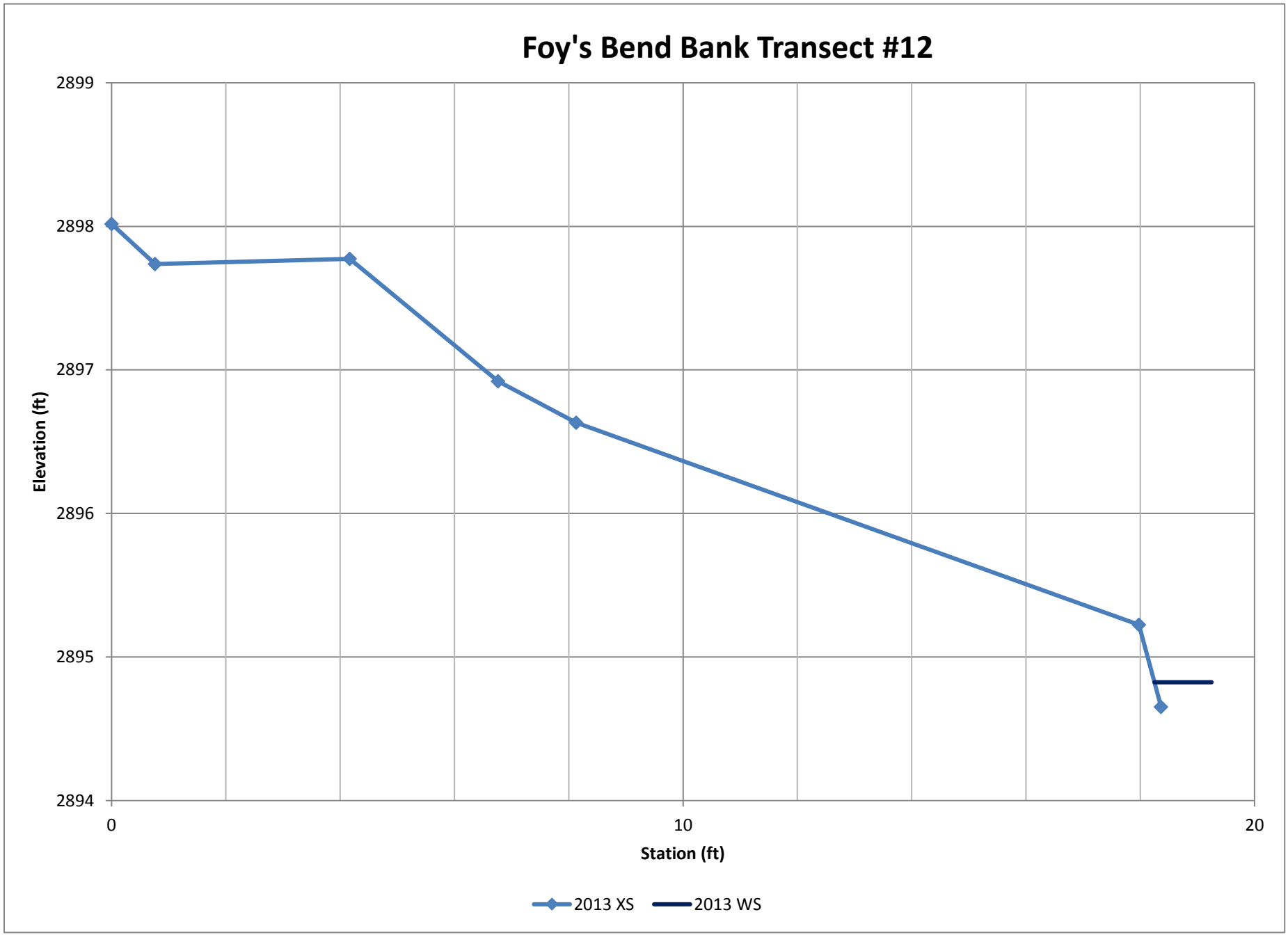
2898
2897
2896
2895
2894
Elevation (ft)
0
10
20
30
Station (ft)
2013 XS
2013 WS


Foy's Bend Bank Transect #12
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2897
2896
2895
2894
Elevation (ft)
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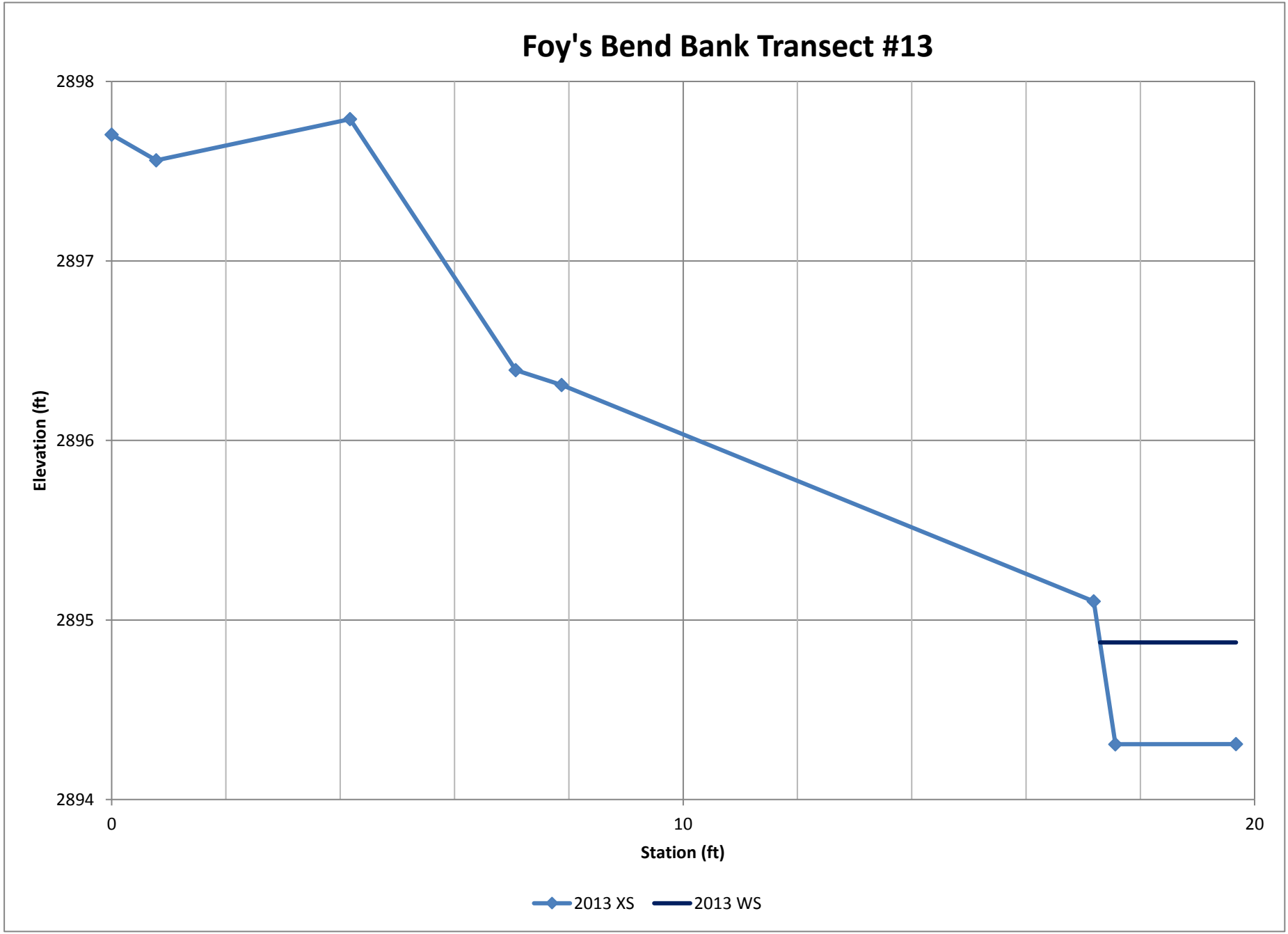
10
20
Station (ft)
2013 XS
2013 WS


Foy's Bend Bank Transect #13
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2896
2895
2894
Elevation (ft)
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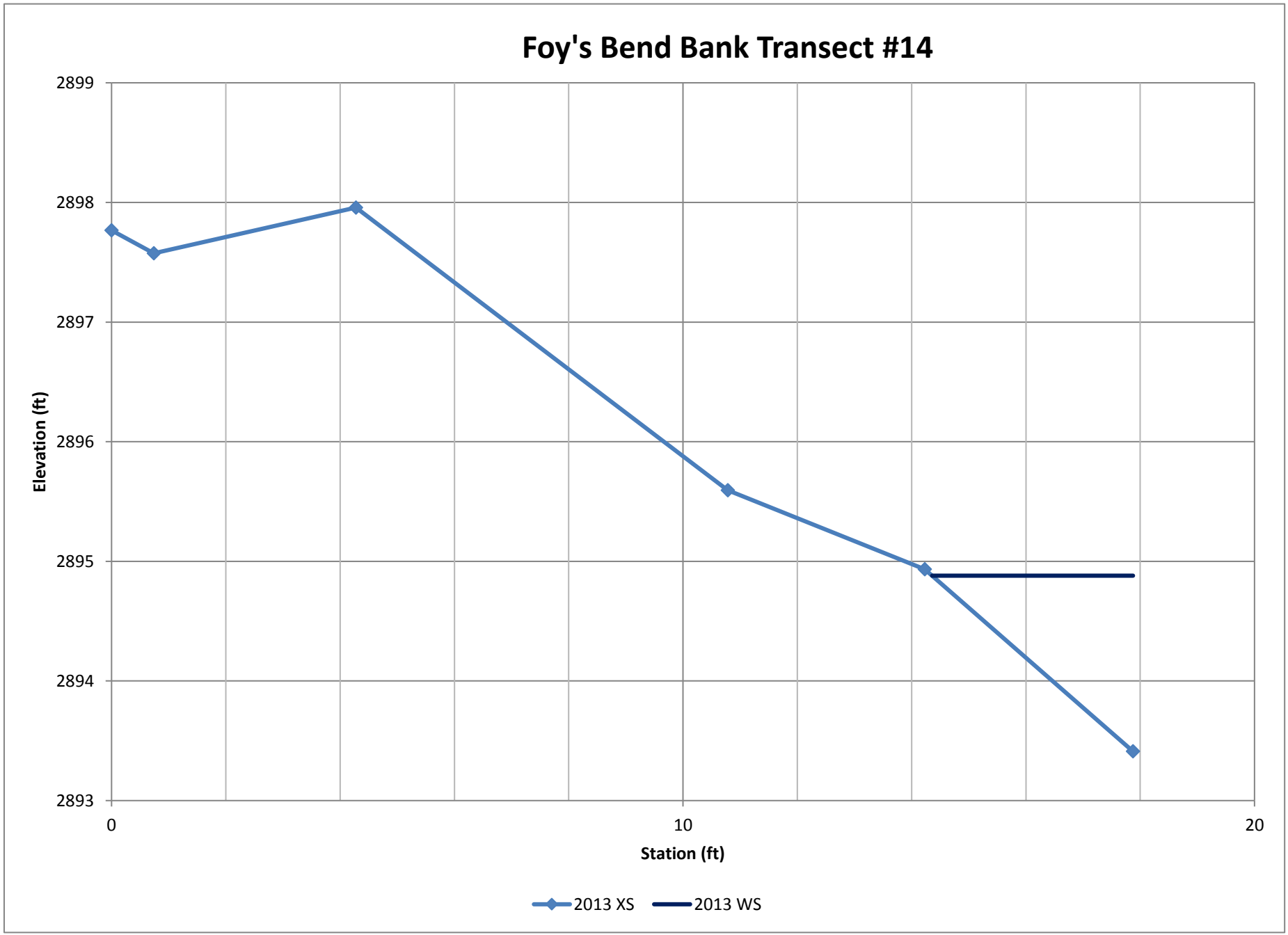
10
20
Station (ft)
2013 XS
2013 WS


Foy's Bend Bank Transect #14
2899
2898
2897
2896
2895
2894
2893
Elevation (ft)
0
10
20
Station (ft)
2013 XS
2013 WS

Appendix C

Riparian Vegetation Transect Plots

MDT Stream Mitigation Monitoring
Foy's Bend Fisheries Conservation Area
Flathead County, Montana

Interval Data Summary Report

Site: **Foys Bend**

date: 9/11/2013 4:22:34 PM

Transect Number: 1 **Compass Direction from Start:** _____

Interval Data:

Ending Station **Community Type:** /

Species	Cover class	Species	Cover class

Ending Station 274 **Community Type:** /

Species	Cover class	Species	Cover class
Agrostis gigantea	3	Alnus incana	1
Alopecurus arundinaceus	2	Aster sp. (purple)	0
Bromus inermis	4	Carex aquatilis	2
Carex nebrascensis	2	Carex utriculata	2
Cirsium arvense	2	Cirsium vulgare	0
Convolvulus arvensis	1	Cornus alba	1
Cynoglossum officinale	0	Dactylis glomerata	2
Leucanthemum vulgare	1	Phalaris arundinacea	5
Poa palustris	2	Poa pratensis	3
Populus angustifolia	2	Populus balsamifera	3
Populus tremuloides	1	Prunus virginiana	1
Shepherdia argentea	1	Solidago canadensis	0
Sonchus arvensis	0	Symphoricarpos albus	2
Taraxacum officinale	1	Verbascum thapsus	0

Transect Notes:

Interval Data Summary Report

Transect Number: 2 **Compass Direction from Start:** _____

Interval Data:

Ending Station 425 **Community Type:** /

Species	Cover class	Species	Cover class
Agropyron sp.	2	Alnus incana	1
Alopecurus arundinaceus	3	Aster sp. (purple)	0
Brassica kaber	2	Bromus inermis	3
Carex nebrascensis	2	Carex utriculata	2
Chamerion angustifolium	0	Cirsium arvense	3
Cornus alba	2	Crataegus douglasii	1
Dactylis glomerata	2	Elymus canadensis	1
Elymus repens	3	Medicago lupulina	0
Phalaris arundinacea	4	Phleum pratense	1
Poa palustris	2	Poa pratensis	2
Populus angustifolia	4	Populus balsamifera	4
Populus tremuloides	4	Prunus virginiana	1
Shepherdia argentea	1	Solidago canadensis	0
Taraxacum officinale	2	Trifolium pratense	2
Trifolium repens	2		

Transect Notes:

Transect Number: 3 **Compass Direction from Start:** _____

Interval Data:

Ending Station 230 **Community Type:** /

Species	Cover class	Species	Cover class
Aster sp. (purple)	0	Bromus inermis	3
Carex nebrascensis	2	Carex utriculata	2
Cirsium arvense	2	Dactylis glomerata	1
Medicago lupulina	1	Medicago sativa	3
Pascopyrum smithii	1	Phalaris arundinacea	5
Poa pratensis	2	Taraxacum officinale	1

Transect Notes:

Interval Data Summary Report

Transect Number: 4 **Compass Direction from Start:** _____

Interval Data:

Ending Station 275 **Community Type:** /

Species	Cover class	Species	Cover class
Bromus inermis	3	Carex aquatilis	1
Carex nebrascensis	3	Carex utriculata	3
Carex vesicaria	0	Cirsium arvense	0
Dactylis glomerata	3	Equisetum arvense	2
Lemna minor	1	Linaria vulgaris	0
Persicaria sp.	0	Phalaris arundinacea	5
Poa palustris	2	Poa pratensis	2
Populus balsamifera	5	Populus tremuloides	2
Prunus virginiana	0	Salix bebbiana	1
Salix exigua	2	Schoenoplectus acutus	0
Symphoricarpos albus	3	Taraxacum officinale	2

Transect Notes:

Interval Data Summary Report

Transect Number: 5 **Compass Direction from Start:** _____

Interval Data:

Ending Station 1375 **Community Type:** /

Species	Cover class	Species	Cover class
Agrostis gigantea	3	Alnus incana	2
Aster sp. (purple)	0	Bare Ground	4
Bromus inermis	4	Carex sp.	2
Chamerion angustifolium	1	Cirsium arvense	0
Coreopsis tinctoria	0	Cornus alba	1
Epilobium ciliatum	0	Equisetum hyemale	2
Hordeum jubatum	0	Juncus compressus	1
Juncus sp.	2	Lactuca serriola	1
Medicago lupulina	1	Melilotus officinalis	3
Mentha arvensis	1	Persicaria sp.	0
Phalaris arundinacea	5	Phleum pratense	1
Plantago lanceolata	0	Poa palustris	4
Populus balsamifera	2	Populus tremuloides	1
Salix exigua	3	Scirpus sp.	0
Solanum dulcamara	1	Solidago canadensis	1
Sonchus arvensis	1	Sporobolus airoides	2
Symphoricarpos albus	2	Taraxacum officinale	2
Trifolium pratense	1	Verbascum thapsus	0

Transect Notes:

Stream vegetation transect

Appendix D

Project Site Photos

MDT Stream Mitigation Monitoring
Foy's Bend Fisheries Conservation Area
Flathead County, Montana

PHOTO INFORMATION

PROJECT NAME: Foy's Bend Stream Mitigation Site

DATE: September 11-13, 2013

Photo Point 1
Location: Exclosure 4
Compass: 315 (Northwest)

Photo Point 2
Location: Exclosure 6
Compass: 270 (West)

Photo Point 3.1
Location: Exclosure 8
Compass: 135 (Southeast)

Photo Point 3.2
Location: Exclosure 8
Compass: 158 (South-Southeast)

Photo Point 3.3
Location: Exclosure 8
Compass: 203 (South-Southwest)

Photo Point 4
Location: Exclosure 14
Compass: 90 (East)

PHOTO INFORMATION

PROJECT NAME: Foy's Bend Stream Mitigation Site

DATE: September 11-13, 2013

Photo Point 5.1
Location: Restored streambank downstream
Compass: 270 (West)

Photo Point 5.2
Location: Restored streambank upstream
Compass: 45 (Northeast)

Photo Point 6.1
Location: Restored streambank downstream
Compass: 270 (West)

Photo Point 6.2
Location: Restored streambank upstream
Compass: 45 (Northeast)

Photo Point 7
Location: Extent of restored streambank, looking down-stream. **Compass:** 45 (Northeast)

PHOTO INFORMATION

PROJECT NAME: Foy's Bend Stream Mitigation Site

DATE: September 11-13, 2013

Photo 1 - Thistle along burlap edge and in pots.

Photo 4 - Cottonwood regeneration in silt deposits along streambank.

Photo 2 - Thistle along burlap edge and in pots.

Photo 5 –Fine soil materials sucked out of coir fascine.

Photo 3 –Willow sprigs with leaves under water.

Photo 6 –*Phalaris* and *Carex* growth at edge of silt deposits.

PHOTO INFORMATION

PROJECT NAME: Foy's Bend Stream Mitigation Site

DATE: September 11-13, 2013

Photo 7 - Large clumps of wetland sod along restored streambank.

Photo 8 - Upstream end of coir fascine not keyed in with wetland sod surrounding.

Photo 9 - Less vegetation establishment on coir without silt deposits.

Photo 10 — Small tear in riparian fence on north side of exclosure #9.

PHOTOGRAPHIC INFORMATION page 1 of 40

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

T1 Start Riparian Transect

T1 End Riparian Transect

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

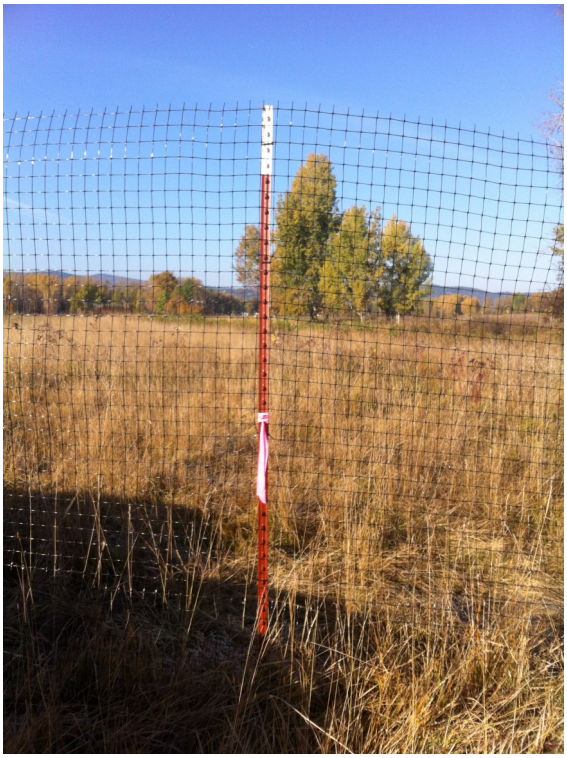
P Point 1

Broken Fence

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

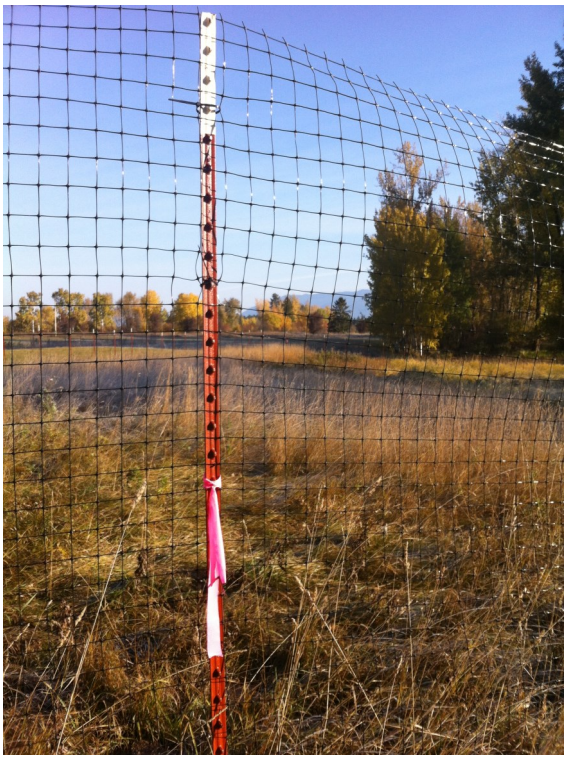
T2 Start Riparian Transect



T2 End Riparian Transect

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013



T3 Start Riparian Transect

T3 End Riparian Transect

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

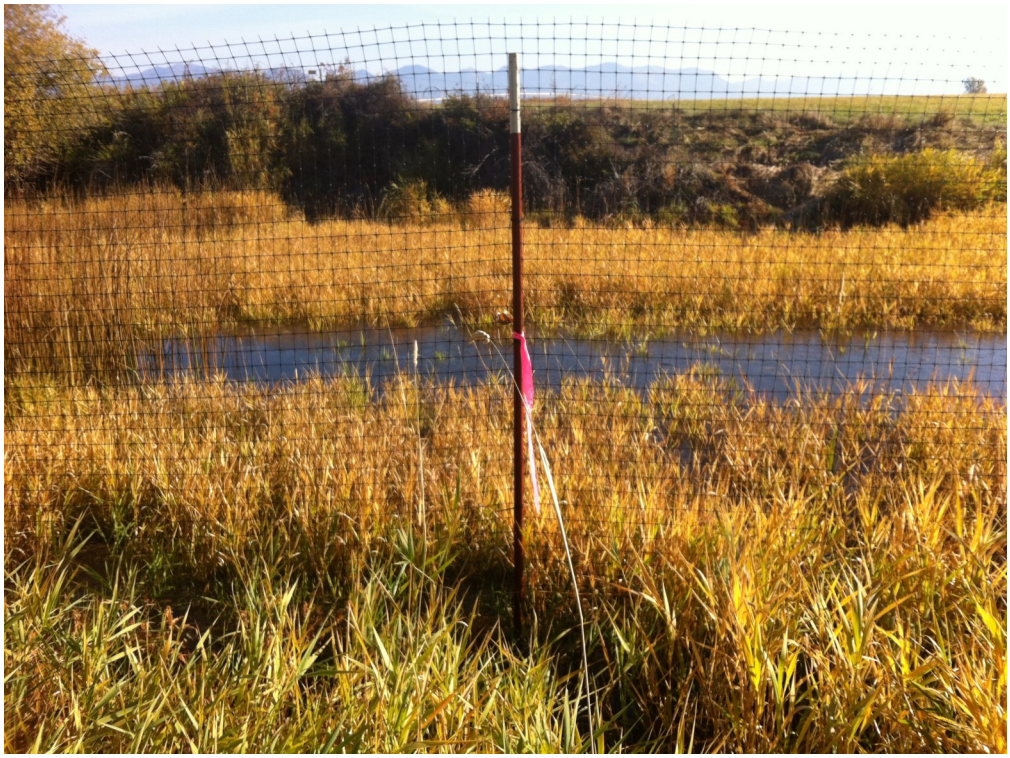
P Point 4

P Point 6

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

T4 Start Riparian Transect



T4 End Riparian Transect

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

P Point 5

P Point 7

PROJECT NAME: MDT Stream Mitigation Foy's Bend

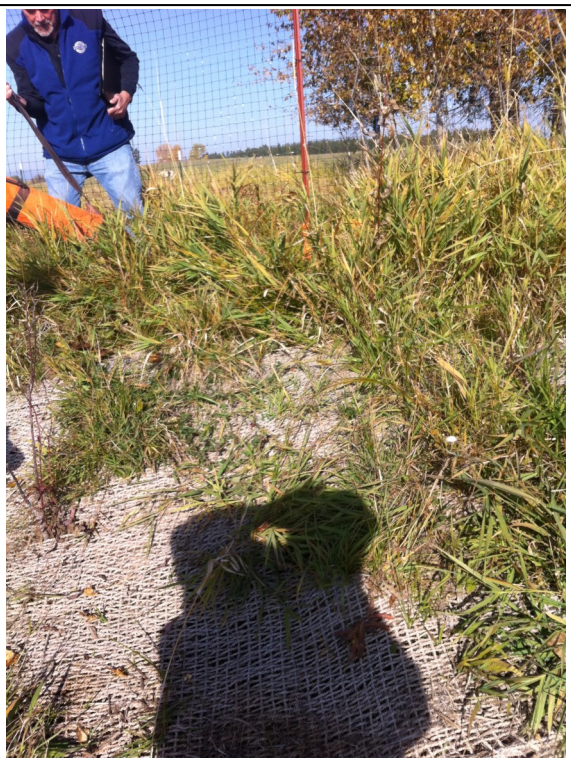
DATE: August 28, 2013

Point 300

Point 300 Looking Down Bank

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013



Point 300 Looking Up Bank

Point 300 Looking Down Stream

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 300 Looking Down stream

Point 307

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 307 Looking Down Bank

Point 307 Looking Up Bank

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 307 Looking up Stream

Point 307 Looking Down Stream

PROJECT NAME: MDT Stream Mitigation Foy's Bend

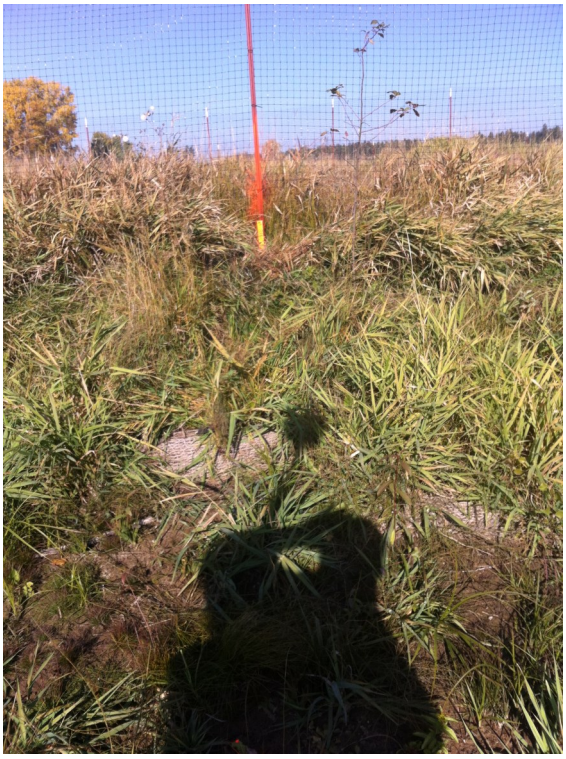
DATE: August 28, 2013

Point 316

Point 316 Looking Down Bank

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013



Point 316 Looking Up Bank

Point 316 Looking Up Stream

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

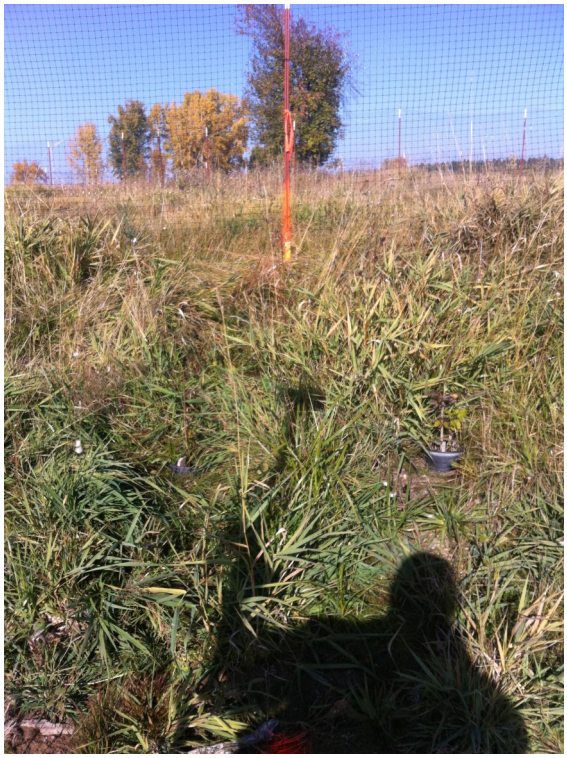
Point 316 Looking Down Stream

Point 325

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 325 Looking Down Bank



Point 325 Looking Up Bank

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 325 Looking Up Stream

Point 325 Looking Down Stream

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 334

Point 334 Looking Down Bank

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 334 Looking Up Bank

Point 334 Looking Up Stream

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 334 Looking Down Stream

Point 343

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 343 Down Bank

Point 343 Up Bank

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point343 Up Stream

Point343 Down Stream

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 352

Point 352 Looking Down Bank

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 352 Looking Up Bank

Point 352 Looking Up Stream

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 352 Looking Down Stream

Point 361

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 361 Looking Down Bank

Point 361 Looking Up Bank

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 361 Looking Up Stream

Point 361 Looking Down Stream

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 370

Point 370 Looking Down Bank

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 370 Looking Up Bank

Point 370 Looking Up Stream

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 370 Looking Down Stream

Point 379

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 379 Looking Down Bank

Point 379 Looking Up Bank

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 379 Looking Up Stream

Point 379 Looking Down Stream

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 388

Point 388 Looking Down Bank

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 388 Looking Up Bank

Point 388 Looking Up Stream

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 388 Looking Down Stream

Point 397

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 397 Looking Down Bank

Point 397 Looking Up Bank

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 397 Looking Up Stream

Point 397 Looking Down Stream

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 407

Point 407 Up Stream

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

Point 407 Down Stream

Point 417

PROJECT NAME: MDT Stream Mitigation Foy's Bend

DATE: August 28, 2013

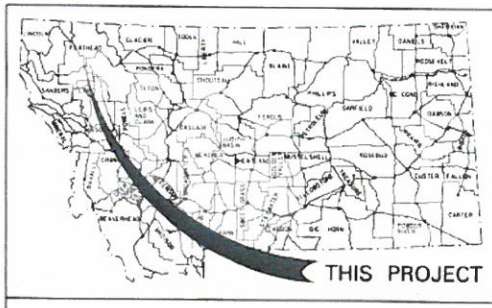
Point 417 Looking Up Stream

Point 417 Looking Down Stream

Appendix E

Foy’s Bend Mitigation Design Sheets

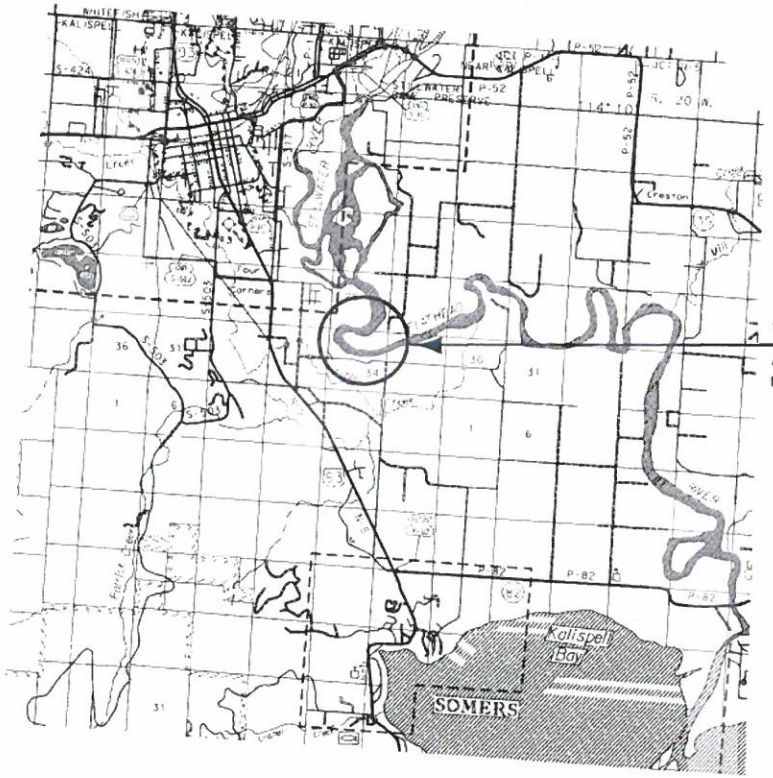
MDT Stream Mitigation Monitoring
Foy's Bend Fisheries Conservation Area
Flathead County, Montana



MONTANA DEPARTMENT OF TRANSPORTATION

FEDERAL AID PROJECT NH 15(99)
AQUATIC RESOURCES MITIGATION
FOY'S BEND STREAM MITIGATION
FLATHEAD COUNTY

LENGTH N/A miles



MONTANA
DEPARTMENT OF TRANSPORTATION

APPROVED : JANUARY 14 20 15

TIM REARDON,
DIRECTOR OF TRANSPORTATION

BY
BUREAU CHIEF,
ENVIRONMENTAL SERVICES

MONTANA
THOMAS S. MARTIN
11228PE
REGISTERED PROFESSIONAL ENGINEER

U.S. DEPARTMENT OF TRANSPORTATION
FEDERAL HIGHWAY ADMINISTRATION

APPROVED :

DIVISION ADMINISTRATOR DATE

MDT MONTANA DEPARTMENT OF TRANSPORTATION	C:\DGN\2038013ENPVP001.DGN 1/8/2013 12:24:45 PM u7213	DESIGNED BY Rose Salyards, PE	12/05/2012	FOY'S BEND STREAM MITIGATION	NH 15(99)
		REVIEWED BY		UPN 2038013	SHEET 1
		CHECKED BY			

TABLE OF CONTENTS

NOTES

UTILITIES

CALL THE UTILITIES UNDERGROUND LOCATION CENTER (1-800-424-5555) OR OTHER NOTIFICATION SYSTEM FOR THE MARKING AND LOCATION OF ALL LINES AND SERVICE BEFORE EXCAVATING. ALL CLEARANCES OR DEPTHS PROVIDED FOR UTILITIES ARE FROM EXISTING GROUND LINE.

PIEZOMETERS

DO NOT DISTURB EXISTING PIEZOMETERS ON THE PROJECT.

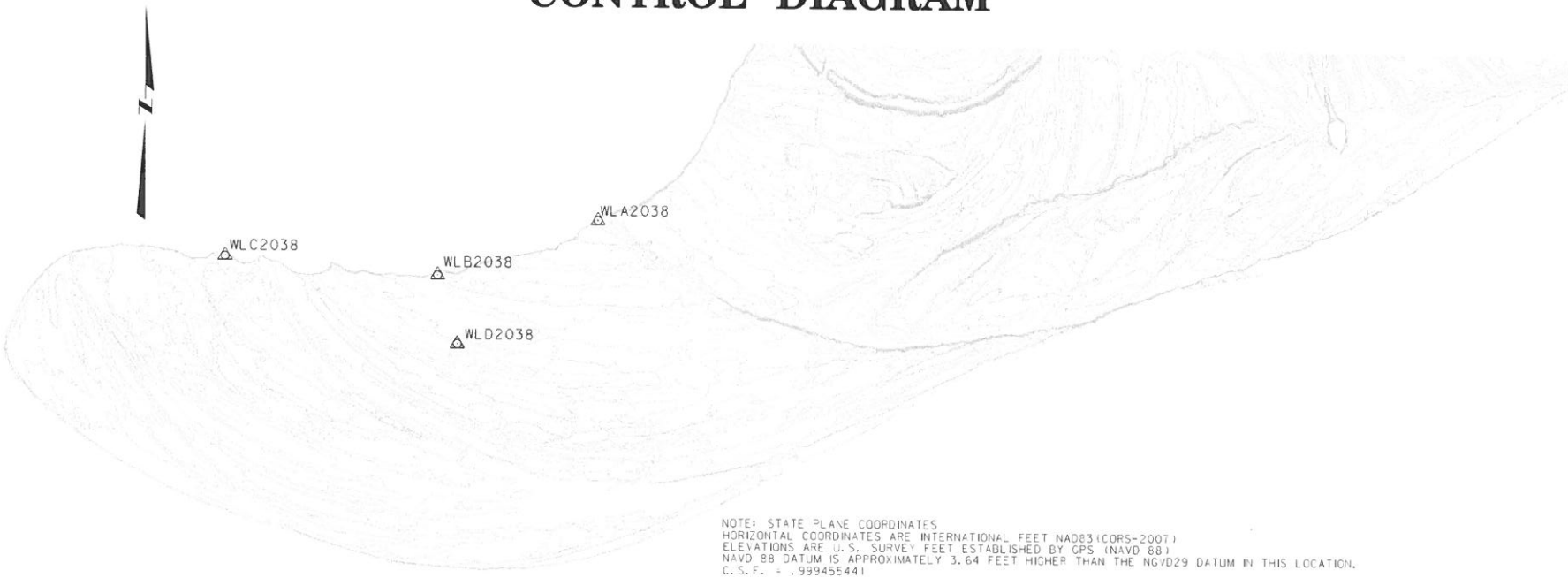
STAGING AREA

STAGING AREA LOCATION MUST BE APPROVED BY BOTH THE PROJECT MANAGER AND MT FISH, WILDLIFE, & PARKS (FWP). COORDINATE WITH FWP AT LEAST 2 WEEKS PRIOR TO CONSTRUCTION TO DETERMINE A LOCATION. FWP CONTACTS:
JOEL TOHTZ (406) 751-4570
KRIS TEMPEL (406) 751-4573
ALAN WOOD (406) 751-4595

WETLANDS

WETLANDS EXIST WITHIN THE PROJECT AREA AND BEYOND THE PROJECT LIMITS. A WETLAND DELINEATION HAS NOT BEEN COMPLETED FOR THIS PROJECT. IMPACTS TO WETLAND AREAS ARE NOT ANTICIPATED IN ASSOCIATION WITH THE PLANNED WORK SO NO PERMITS FOR FOR WETLAND IMPACTS HAVE BEEN OBTAINED. ANY ACTION IMPACTING WETLAND AREAS WITHOUT THE APPROPRIATE PERMITTING IS THE RESPONSIBILITY OF THE CONTRACTOR.

CONTROL DIAGRAM



NOTE: STATE PLANE COORDINATES
HORIZONTAL COORDINATES ARE INTERNATIONAL FEET NAD83(CORS-2007)
ELEVATIONS ARE U.S. SURVEY FEET ESTABLISHED BY GPS (NAVD 88)
NAVD 88 DATUM IS APPROXIMATELY 3.64 FEET HIGHER THAN THE NGVD29 DATUM IN THIS LOCATION.
C.S.F. = .999945441

NOTE: THE ELEVATIONS WERE ESTABLISHED FROM GPS OPUS SOLUTIONS AND ARE NEAR NAVD88 ELEVATIONS
ELEVATION BETWEEN CONTROL POINTS WAS ESTABLISHED BY TERRESTRIAL MEASUREMENTS USING A TRIMBLE
S6 ROBOTIC TOTAL STATION.

THIS PROJECT UTILIZES LIDAR SURVEY DATA COLLECTED BETWEEN SEPTEMBER 22 AND 29, 2009 AS PART OF THE FLATHEAD CHANNEL MIGRATION ZONE STUDY COMMISSIONED BY THE MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY, MONTANA FISH, WILDLIFE, AND PARKS, AND THE FLATHEAD LAKERS.

CONTROL MARK ABSTRACT

POINT NAME/NUMBER	N OR Y COORDINATE	E OR X COORDINATE	POINT ELEVATION	LOCATION AND DESCRIPTION
A2038	810,332.138	1,458,149.392	2,900.63	WLA2038 FROM THE INTERSECTION OF HOLT STAGE AND STEEL BRIDGE ROAD ON THE EAST SIDE OF THE NEWLY REPLACED OLD STEEL BRIDGE GO SOUTH ON STEEL BRIDGE ROAD 4.8 MILES TO A FWP PARKING CORAL WITH GREEN GATES. TURN WEST AND FOLLOW GRAVEL DRIVE BETWEEN LIGHT GREEN STEEL SHOP AND A BROWN TRAILER HOUSE AT 920 FEET TURN RIGHT ON A FARM FIELD ROAD GOING WESTERLY AT 1200 FEET ROAD TURNS SOUTHERLY STOP AT 1285 FEET AND THE POINT LIES 45 FEET NORTHERLY OF THE FARM ROAD. IT IS ALSO 85 FEET FROM A POWERPOLE WHICH BEARS 34 DEGREES. MARK IS 8 FEET WEST OF TOP OF BANK. SET A 2" A.C. MARKED WLA2038 2012. WITNESS POST SET 3 FEET NORTH.
B2038	809,484.721	1,457,854.826	2,901.65	WLB2038 FROM POINT WLA2038 FOLLOW THE FARM FIELD ROAD IN A DOWNSTREAM DIRECTION STAYING ON THE RIVER SIDE OF THE HAYFIELD 965 FEET MARK IS NORTH TOWARDS THE RIVER 35 FEET. MARK IS DOWNSTREAM 95 FEET FROM AN 8 FOOT HIGH T-POST. SET A 2" A.C. MARK WLB2038 2012 WITNESS POST 3 FEET NORTH.
C2038	808,361.675	1,457,949.167	**2,899.94**	WLC2038 FROM THE INTERSECTION OF HOLT STAGE AND STEEL BRIDGE ROAD ON THE EAST SIDE OF THE NEWLY REPLACED OLD STEEL BRIDGE GO SOUTH ON STEEL BRIDGE ROAD 4.8 MILES TO A FWP PARKING CORAL WITH GREEN GATES. TURN WEST AND FOLLOW GRAVEL DRIVE BETWEEN LIGHT GREEN STEEL SHOP AND A BROWN TRAILER HOUSE AT 920 FEET TURN RIGHT ON A FARM FIELD ROAD GOING WESTERLY AT 1200 FEET ROAD TURNS SOUTHERLY GO AROUND A DEAD COTTONWOOD AND CONTINUE WEST ALONG THE NORTH EDGE OF THE FIELD DRIVE WESTERLY TO 3400 FEET AND THE POINT BEARS 320 DEGREES AT 105 FEET. SET A 2" A.C. MARKED WLC2038 2012 WITNESS POST 3 FEET EAST.
D2038	809,588.808	1,457,489.729	2,901.38	WLD2038 FROM WLB2038 GO 350 FEET AT AN AZIMUTH OF 186 DEGREES. SET A 2" A.C. MARKED WLB2038 2012 WITH A WITNESS POST 3 FEET SOUTH. MARK IS NORTH FROM THE SOUTH EDGE OF THE FIELD 35 FEET.

SUMMARY

GRADING				
GRADING	cubic yards			REMARKS
	UNCL. EXC.	EXCESS EXCAVATION *	EMB.+	
	2,030	2,030		BANK EXCAVATION
	230	115		FASCINE TRENCH
TOTAL	2,230	* 2,145		

* FOR INFORMATION ONLY

EXCLOSURE FENCING			
STATION	FENCE SPECIAL DESIGN (lin. ft)		REMARKS
	17,780		ALL EXCLOSURES
TOTAL	17,780		

REVEGETATION									
STATION	lump sum	cu. yards	acres	acres	acres	lump sum	sq. yards	sq. yards	REMARKS
	TREE & SHRUB PLANTING *	TOPSOIL SALVAGING & PLACING	COMPOST	UPLAND SEEDING	WETLAND SEEDING	WILLOW CUTTINGS	EROSION CONTROL BLANKET-BIO	COIR EROSION CONTROL NET	
		500	0.66	0.35	0.31	1	1,350	1,950	BANK RESTORATION AREA
	1								PLANTING ZONES
TOTAL	1	500	0.66	0.35	0.31	1	1,350	1,950	

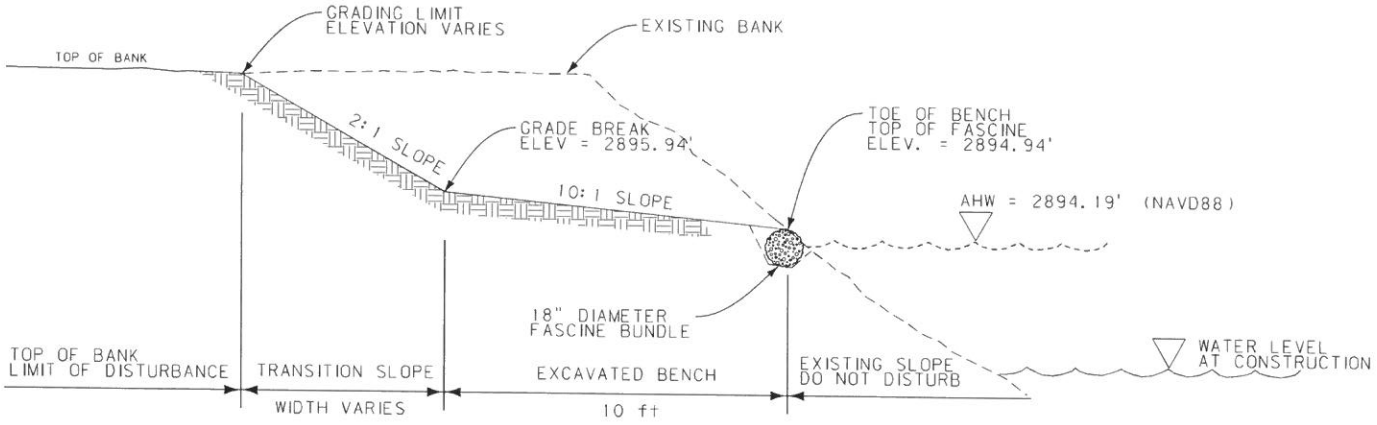
* TREE & SHRUB PLANTING INCLUDES BANK RESTORATION AREA (PLANTING ZONE 15)

LOCATION	WILLOW STAKES (each) *	FASCINE (lin. ft.)	REMARKS
BANK RESTORATION AREA		1,350	18" DIAMETER
BANK RESTORATION AREA	675		1 STAKE PER 2 FEET
TOTAL	675	1,350	

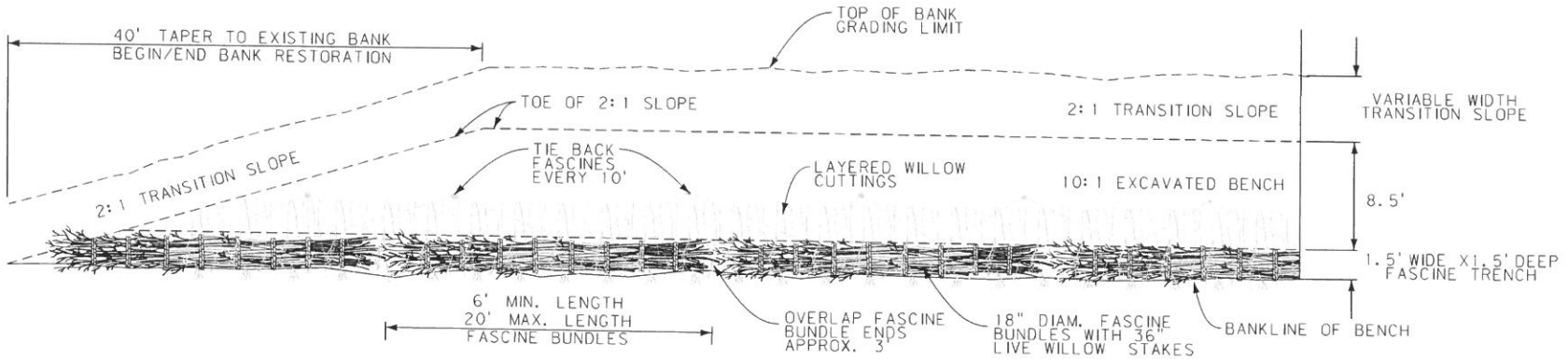
* FOR INFORMATION ONLY. COST OF WILLOW STAKES INCLUDED IN COST OF FASCINE.

BANK RESTORATION DETAIL

TYPICAL SECTION



PLAN VIEW



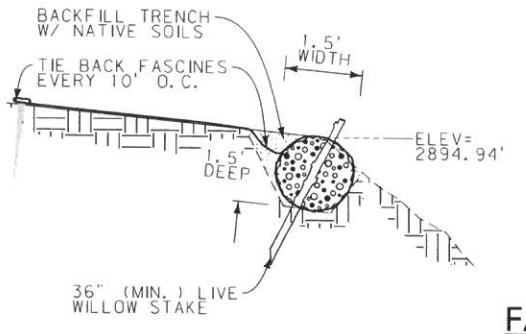
NOTE:

PREPARE 18" DIAMETER FASCINE BUNDLES WITH 1/2" TO 2" CONIFER SLASH & WILLOW CUTTINGS WITH ALL BRANCH ENDS FACING THE SAME DIRECTION. TIE EVERY 12" ON CENTER. POSITION END TO END AND OVERLAP ENDS APPROX. 3' OR MORE LEAVING NO GAPS BETWEEN BUNDLES. PLACE BUNDLES ENTIRELY WITHIN THE TRENCH AT THE SPECIFIED ELEVATION.

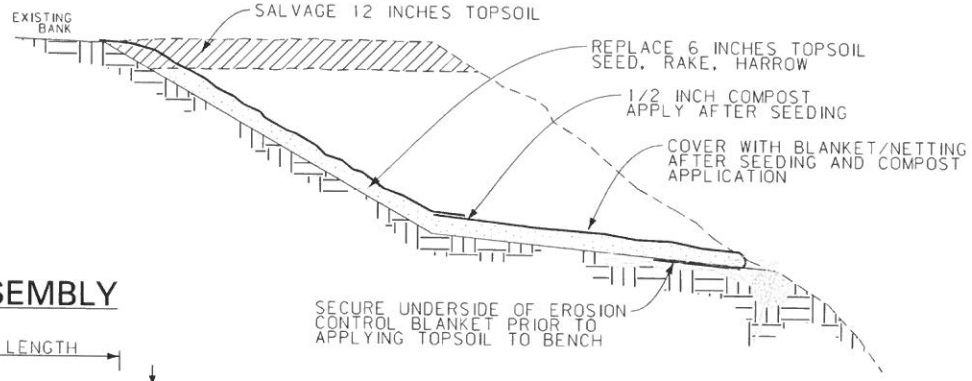
MDT MONTANA DEPARTMENT OF TRANSPORTATION	C:\DGN\2038013ENPVP001.DGN	DESIGNED BY	Wade Salyards, PE	12/05/2012	FOY'S BEND STREAM MITIGATION	NH 15(99)
	1/14/2013	REVIEWED BY				
	2:32:04 PM u7713	CHECKED BY			UPN 2038013	SHEET 5

BANK RESTORATION DETAIL

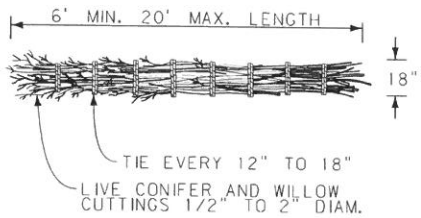
FASCINE INSTALLATION



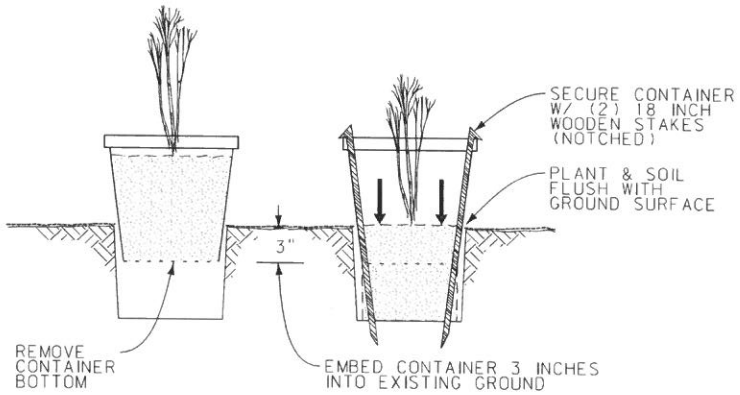
TOPSOIL SALVAGE & PLACE



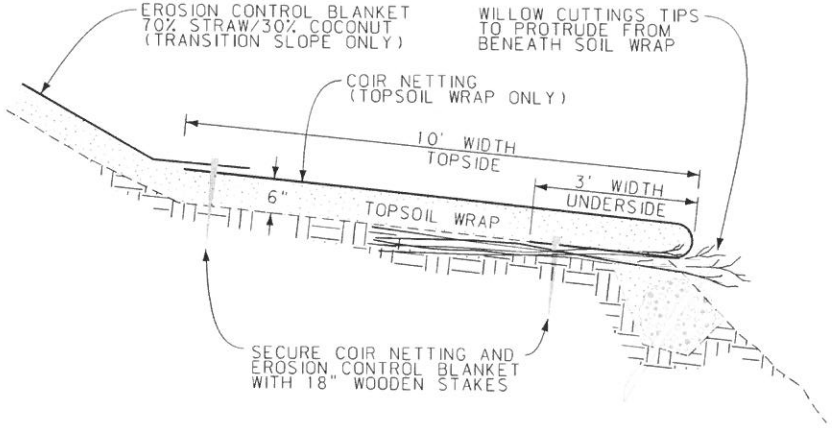
FASCINE ASSEMBLY



RODENT PROTECTION



TOPSOIL WRAP



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	1/14/2013	REVIEWED BY			
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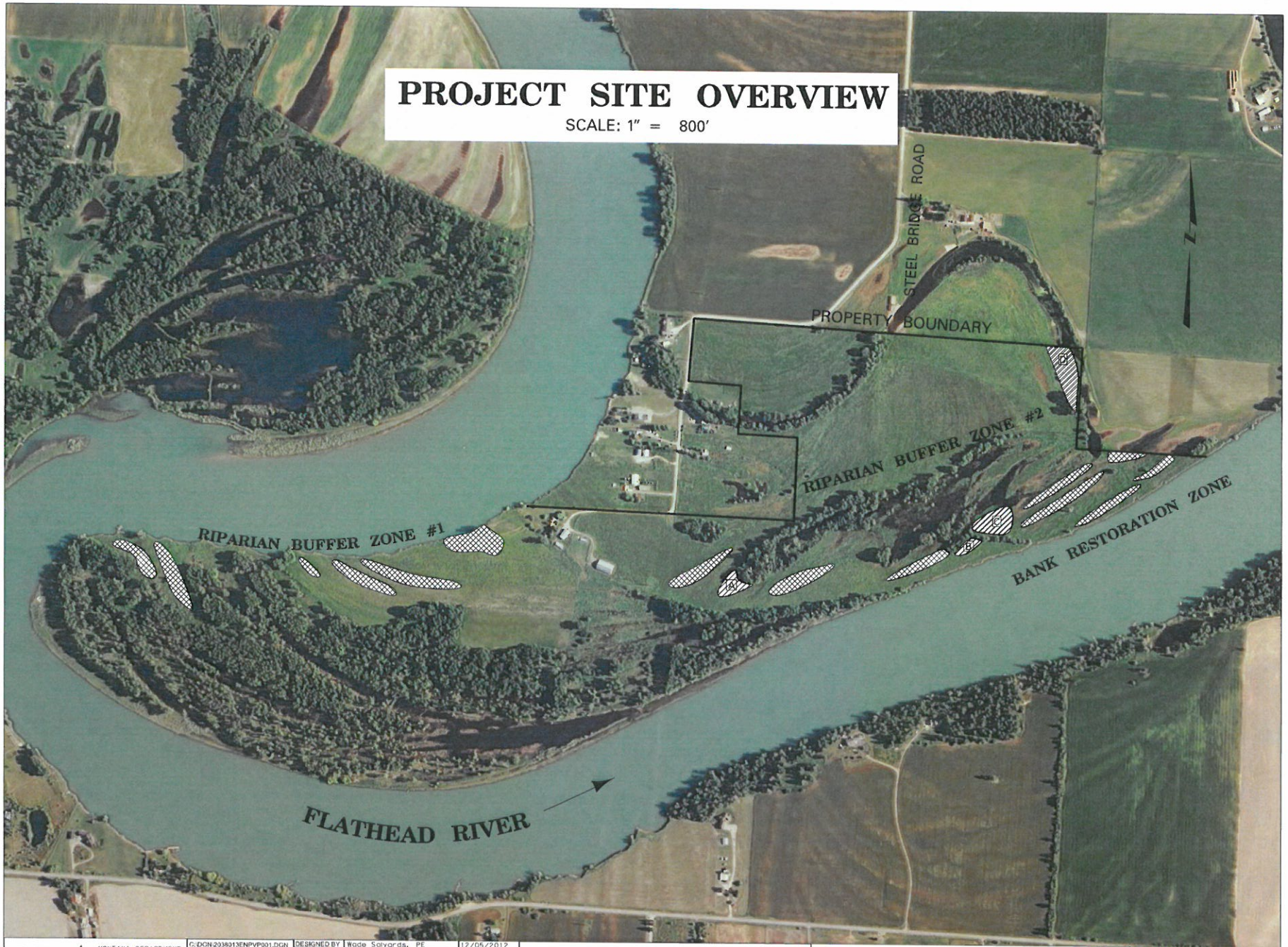
PROJECT SITE OVERVIEW

SCALE: 1" = 800'



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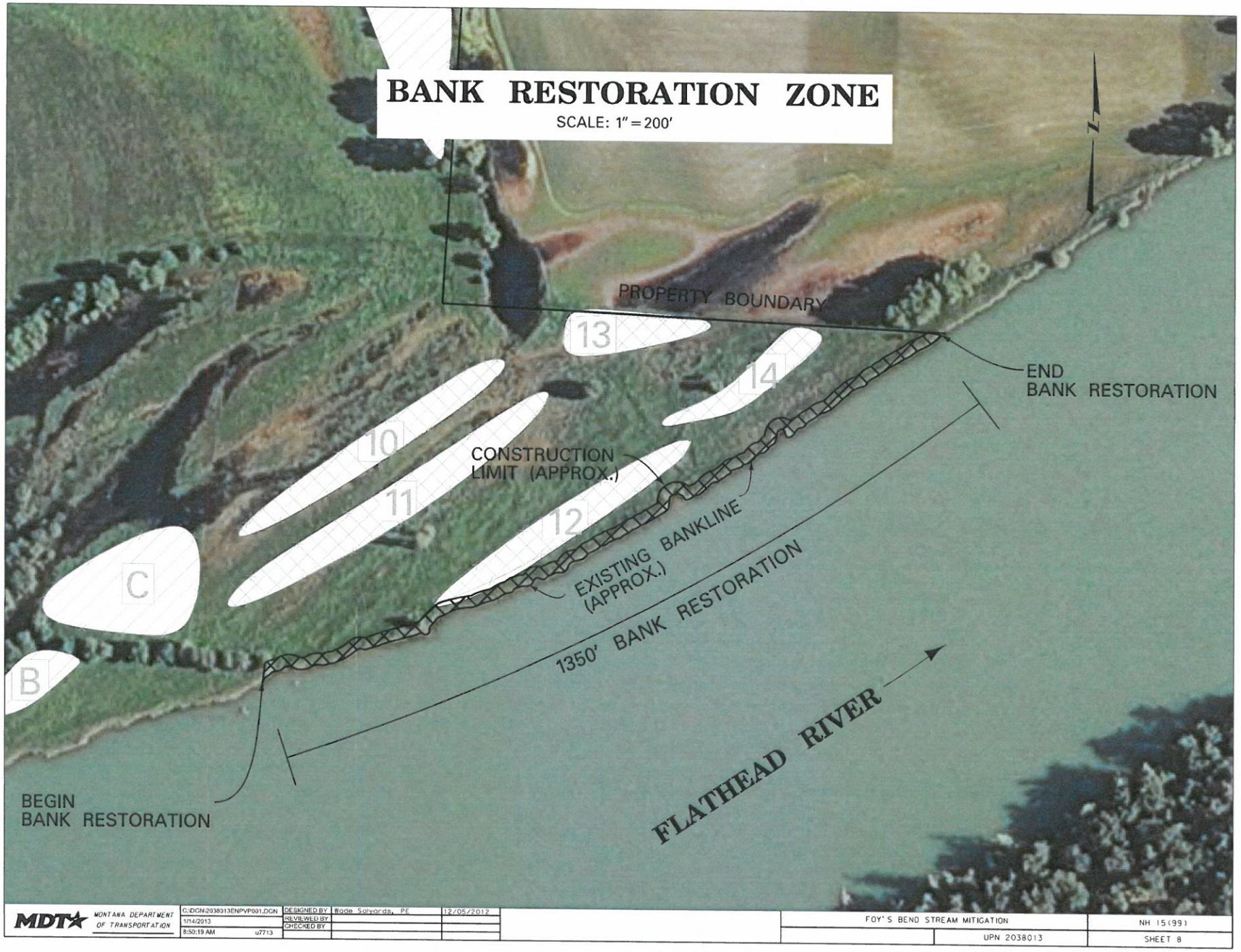

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	1/14/2013	REVIEWED BY				
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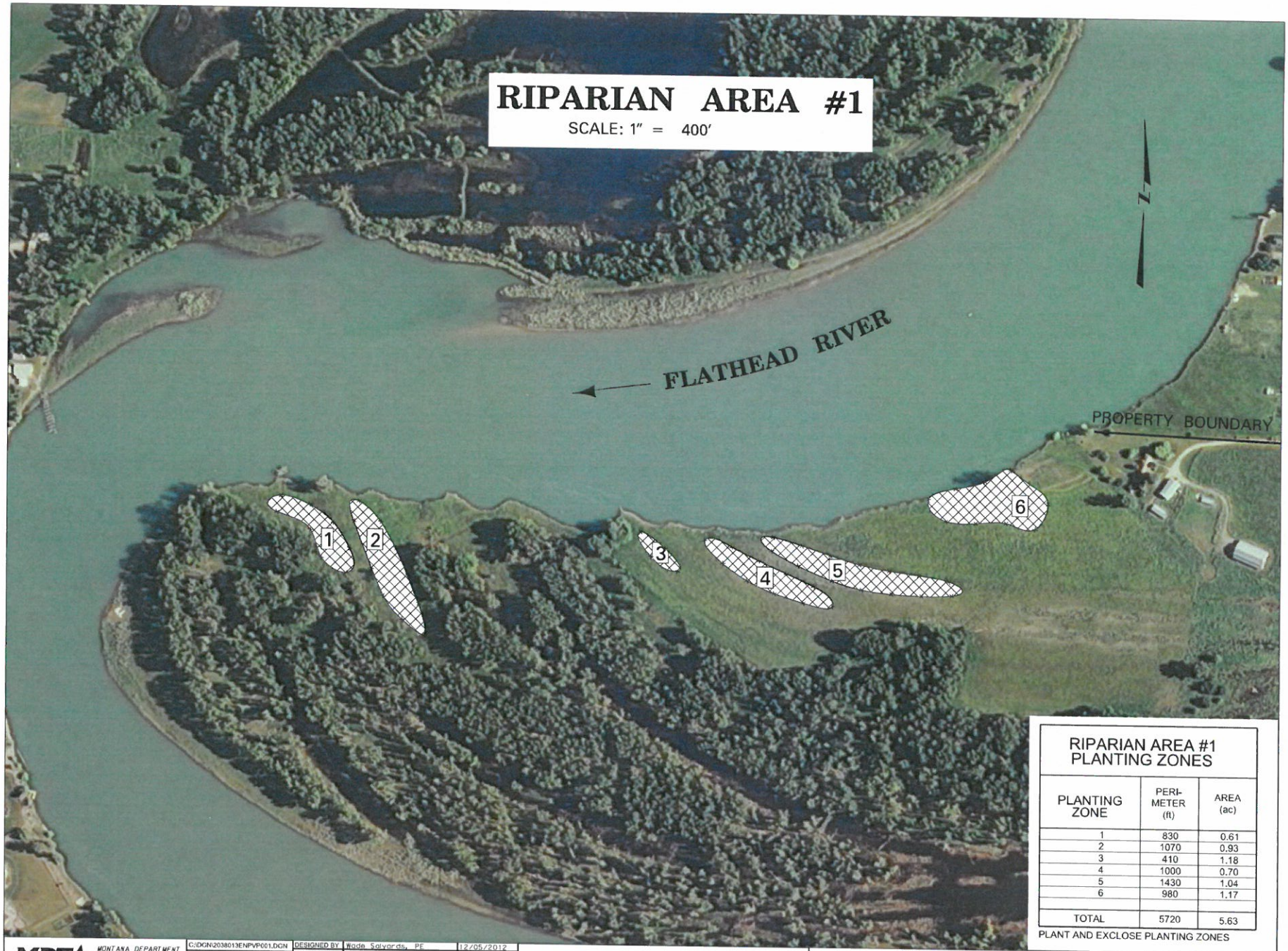
RIPARIAN AREA #1

SCALE: 1" = 400'



RIPARIAN AREA #1 PLANTING ZONES		
PLANTING ZONE	PERI-METER (ft)	AREA (ac)
1	830	0.61
2	1070	0.93
3	410	1.18
4	1000	0.70
5	1430	1.04
6	980	1.17
TOTAL	5720	5.63

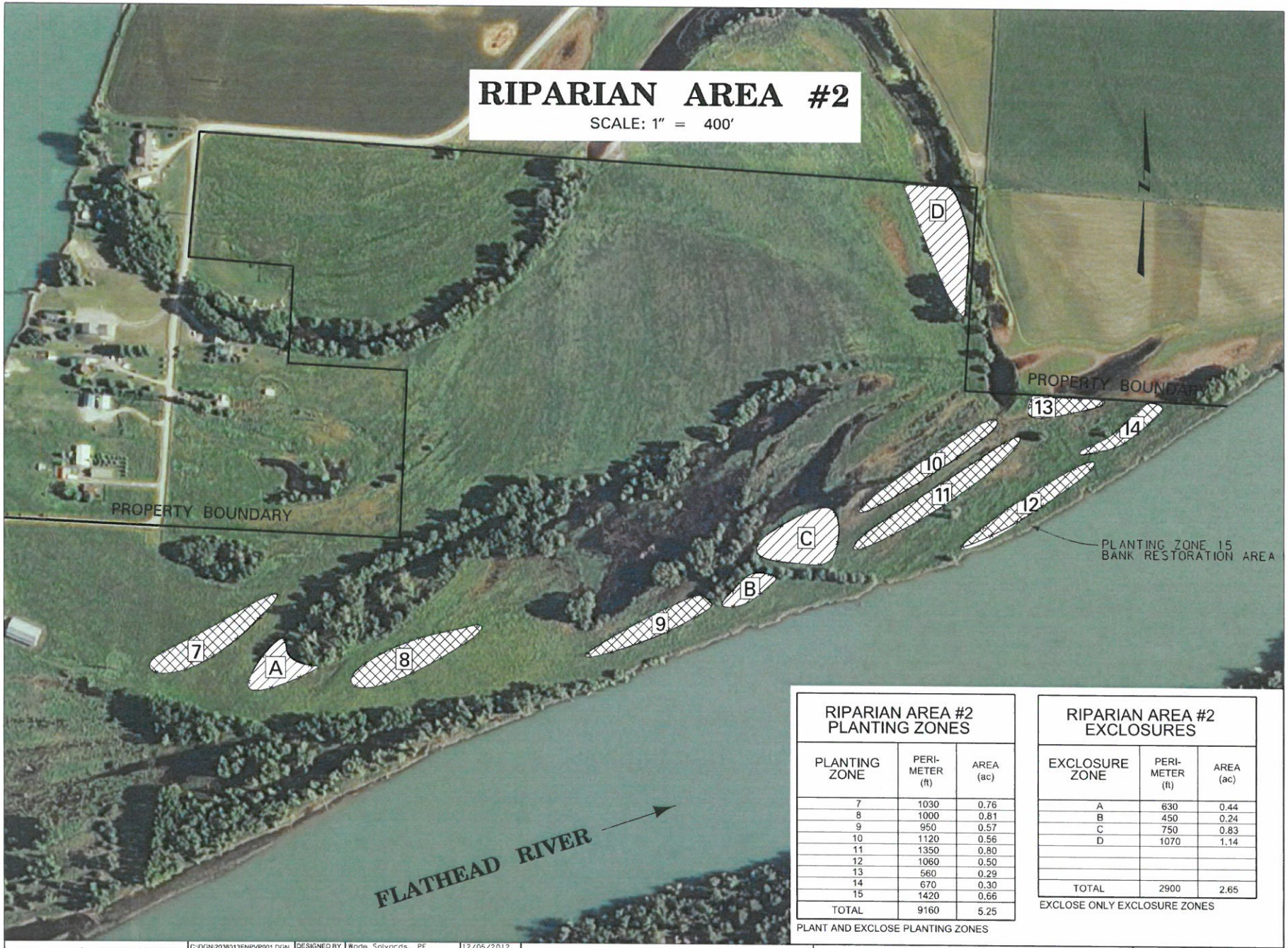
PLANT AND EXCLOSE PLANTING ZONES

MDT MONTANA DEPARTMENT OF TRANSPORTATION

C:\DGN\2038013ENPVP001.DGN	DESIGNED BY	Wade Salyards, PE	12/05/2012
1/9/2013	REVIEWED BY		
12:25:09 PM u7713	CHECKED BY		

FOY'S BEND STREAM MITIGATION | NH 15(99)

UPN 2038013 | SHEET 9



RIPARIAN AREA #2 PLANTING ZONES

PLANTING ZONE	PERI-METER (ft)	AREA (ac)
7	1030	0.76
8	1000	0.81
9	950	0.57
10	1120	0.56
11	1350	0.80
12	1060	0.50
13	560	0.29
14	670	0.30
15	1420	0.66
TOTAL	9160	5.25

PLANT AND EXCLOSE PLANTING ZONES

RIPARIAN AREA #2 EXCLOSURES

EXCLOSURE ZONE	PERI-METER (ft)	AREA (ac)
A	630	0.44
B	450	0.24
C	750	0.83
D	1070	1.14
TOTAL	2900	2.65

EXCLOSE ONLY EXCLOSURE ZONES

MDT MONTANA DEPARTMENT OF TRANSPORTATION

C:\DGN\2038013ENPVP001.DGN	DESIGNED BY	Wade Salyards, PE	12/05/2012
1/9/2013	REVIEWED BY		
12:25:11 PM u7713	CHECKED BY		

FOY'S BEND STREAM MITIGATION | NH 15(99)
UPN 2038013 | SHEET 10

FENCING EXCLOSURE COORDINATE TABLES

FENCING EXCLOSURE COORDINATES

POINT	EXCLOSURE	N OR Y COORDINATE	E OR X COORDINATE
1000	1	1 457 904.412	807 733.283
1001	1	1 457 877.732	807 824.400
1002	1	1 457 846.604	807 904.405
1003	1	1 457 768.785	807 919.962
1004	1	1 457 675.402	808 013.301
1005	1	1 457 710.976	808 062.193
1006	1	1 457 816.734	808 006.564
1007	1	1 457 893.295	807 951.075
1008	1	1 457 966.668	807 788.842
1009	1	1 457 722.409	807 939.839
1010	2	1 457 958.419	807 999.977
1011	2	1 457 797.689	808 068.860
1012	2	1 457 584.048	808 144.804
1013	2	1 457 533.104	808 208.868
1014	2	1 457 445.743	808 306.265
1015	2	1 457 613.146	808 253.315
1016	2	1 457 784.348	808 179.978
1017	2	1 457 913.306	808 104.417
1018	3	1 457 813.531	808 974.054
1019	3	1 457 737.935	809 042.947
1020	3	1 457 706.807	809 078.505
1021	3	1 457 702.348	809 165.805
1022	3	1 457 866.892	808 587.388
1023	4	1 457 815.754	809 178.511
1024	4	1 457 729.041	809 267.405
1025	4	1 457 653.445	809 380.746
1026	4	1 457 606.754	809 531.866
1027	4	1 457 575.626	809 640.762
1028	4	1 457 640.105	809 631.872
1029	4	1 457 713.477	809 451.861
1030	4	1 457 795.743	809 278.517
1031	4	1 457 826.871	809 242.959
1032	5	1 457 793.520	809 387.413
1033	5	1 457 713.477	809 547.423
1034	5	1 457 655.669	809 691.876
1035	5	1 457 635.658	809 840.774
1036	5	1 457 631.211	810 098.567
1037	5	1 457 697.914	810 031.897
1038	5	1 457 715.701	809 769.658
1039	5	1 457 780.180	809 582.980
1040	5	1 457 849.105	809 378.523
1041	6	1 458 067.872	810 210.718
1042	6	1 458 009.166	810 277.174
1043	6	1 457 970.688	810 364.254
1044	6	1 457 830.690	810 301.059
1045	6	1 457 891.416	810 207.464
1046	6	1 457 884.051	810 137.239
1047	6	1 457 870.362	809 981.736
1048	6	1 457 968.373	809 914.249
1049	6	1 457 995.907	810 018.235
1050	6	1 458 007.024	810 118.241
1051	6	1 458 044.821	810 171.577
1052	6	1 458 062.609	810 196.023

* PLANTING ZONE 15 IS DEFINED BY THE BANK RESTORATION AREA. FENCE ALL DISTURBED AREAS WITHIN THE CONSTRUCTION LIMITS OF THE BANK RESTORATION AREA.

FENCING EXCLOSURE COORDINATES

POINT	EXCLOSURE	N OR Y COORDINATE	E OR X COORDINATE
1053	7	1 457 909.700	811 793.438
1054	7	1 457 811.870	811 635.651
1055	7	1 457 747.391	811 506.754
1056	7	1 457 696.253	811 408.970
1057	7	1 457 645.115	811 440.083
1058	7	1 457 674.019	811 580.092
1059	7	1 457 754.062	811 695.655
1060	7	1 457 851.891	811 802.328
1061	7	1 457 938.604	811 873.443
1062	8	1 457 809.635	812 457.368
1063	8	1 457 832.981	812 515.705
1064	8	1 457 801.853	812 546.818
1065	8	1 457 576.178	812 154.016
1066	8	1 457 642.324	812 041.231
1067	8	1 457 759.053	812 243.466
1068	8	1 457 797.962	812 379.586
1069	9	1 457 937.098	813 243.780
1070	9	1 457 908.192	813 268.228
1071	9	1 457 892.627	813 297.120
1072	9	1 457 825.921	813 174.883
1073	9	1 457 790.345	813 105.986
1074	9	1 457 712.521	812 888.182
1075	9	1 457 716.968	812 828.175
1076	9	1 457 857.051	813 074.871
1077	9	1 457 905.969	813 179.328
1078	10	1 458 523.655	814 194.093
1079	10	1 458 459.173	814 100.748
1080	10	1 458 305.784	813 954.064
1081	10	1 458 221.254	813 758.485
1082	10	1 458 183.454	813 754.040
1083	10	1 458 285.737	813 940.729
1084	10	1 458 505.867	814 260.768
1085	11	1 458 463.620	814 276.325
1086	11	1 458 341.325	814 098.526
1087	11	1 458 267.948	813 987.401
1088	11	1 458 167.889	813 827.382
1089	11	1 458 105.630	813 747.373
1090	11	1 458 052.265	813 729.593
1091	11	1 458 216.807	814 045.186
1092	11	1 458 399.137	814 269.658
1093	11	1 458 459.173	814 305.217
1094	12	1 458 383.572	814 516.354
1095	12	1 458 261.278	814 311.885
1096	12	1 458 176.783	814 196.315
1097	12	1 458 098.960	814 102.971
1098	12	1 458 085.300	814 090.172
1099	12	1 458 121.280	814 191.843
1100	12	1 458 219.031	814 356.335
1101	12	1 458 327.984	814 511.909
1102	12	1 458 379.125	814 551.914

FENCING EXCLOSURE COORDINATES

POINT	EXCLOSURE	N OR Y COORDINATE	E OR X COORDINATE
1103	13	1 458 585.914	814 583.028
1104	13	1 458 587.569	814 401.408
1105	13	1 458 591.297	814 328.109
1106	13	1 458 563.679	814 322.997
1107	13	1 458 503.643	814 311.885
1108	13	1 458 543.667	814 500.796
1109	13	1 458 563.679	814 571.916
1110	14	1 458 575.142	814 716.858
1111	14	1 458 568.126	814 756.383
1112	14	1 458 548.114	814 774.163
1113	14	1 458 483.631	814 691.930
1114	14	1 458 421.372	814 620.811
1115	14	1 458 408.031	814 531.911
1116	14	1 458 394.690	814 485.239
1117	14	1 458 419.149	814 489.684
1118	14	1 458 452.502	814 596.363
1119	14	1 458 563.679	814 694.153
1120	A	1 457 770.598	811 877.829
1121	A	1 457 727.401	811 875.289
1122	A	1 457 695.638	811 908.307
1123	A	1 457 682.932	811 966.723
1124	A	1 457 688.014	812 007.360
1125	A	1 457 605.431	811 837.191
1126	A	1 457 590.185	811 719.089
1127	A	1 457 719.777	811 796.554
1128	A	1 457 784.574	811 861.320
1129	B	1 457 988.240	813 508.257
1130	B	1 458 016.133	813 407.967
1131	B	1 457 950.062	813 359.707
1132	B	1 457 881.450	813 282.237
1133	B	1 457 888.180	813 397.132
1134	B	1 457 972.675	813 479.364
1135	C	1 458 023.915	813 692.366
1136	C	1 458 031.142	813 592.354
1137	C	1 458 044.483	813 450.115
1138	C	1 458 073.389	813 419.000
1139	C	1 458 120.083	813 436.780
1140	C	1 458 231.260	813 632.359
1141	C	1 458 215.695	813 707.923
1142	D	1 459 290.636	814 072.182
1143	D	1 459 208.048	814 103.932
1144	D	1 459 116.565	814 131.872
1145	D	1 459 017.418	814 123.348
1146	D	1 458 926.062	814 114.470
1147	D	1 458 833.437	814 117.007
1148	D	1 458 886.728	814 080.228
1149	D	1 458 929.788	814 049.322
1150	D	1 459 239.812	813 931.213
1151	D	1 459 283.013	813 910.893
1152	D	1 459 293.177	813 912.163
1153	D	1 459 283.109	814 035.872
* 1154	15	1 457 950.000	813 806.000
* 1155	15	1 458 560.000	814 968.000