
MONTANA DEPARTMENT OF TRANSPORTATION STREAM MITIGATION MONITORING REPORT

*Foy's Bend Fisheries Conservation Area
Flathead County, Montana*

*Project Completed: 2013
Monitoring Report #3: December 2015*



Prepared for:



Prepared by:



MONTANA DEPARTMENT OF TRANSPORTATION

STREAM MITIGATION MONITORING REPORT #3

YEAR 2015

*Foy's Bends Fisheries Conservation Area
Flathead County, Montana*

MDT Project Number: NH-MT 5-3(50) 109F
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Cover Photo: Upstream extent of reconstructed bank segment of Flathead River, 2015.

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1.0 INTRODUCTION

The Montana Department of Transportation (MDT), in partnership with Montana Fish, Wildlife and Parks (FWP), has implemented a stream mitigation project at Foy's Bend Fisheries Conservation Area (FCA) near Kalispell, Montana. The goal of the mitigation project is to offset stream and riparian impacts resulting from the Kalispell Bypass and other transportation projects in the Missoula District. Specific project objectives designed to meet this goal include:

- Providing 6,050 linear feet of riparian buffer by establishing 18 fenced exclosures within the Foy's Bend FCA
- Installing woody vegetation plantings within 14 of the 18 fenced exclosures
- Stabilizing 1,350 feet of an eroding bank of the Flathead River utilizing a soil lift and coir fascine.

If successful, the mitigation project will preserve, create, enhance, restore, and maintain permanent, naturally self-sustaining, native or native-like 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 mitigation project is to be monitored for five years to evaluate compliance toward meeting performance standards. This project was constructed during the spring of 2013; therefore, these results provide documentation of the site's condition during the third growing season following the project's completion. The following report provides results from the third year of monitoring, and compares these results to the following project performance standards outlined in the post-construction monitoring plan for the site:

Quantitative success criteria:

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 50% areal cover of beneficial plant species by the end of the monitoring period.
 - a) **Vegetation Success** will be achieved when combined areal cover of riparian and stream bank 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 and aerial coverage of 50% or greater 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 stream bank 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. During the 3rd and final monitoring years, ratings for the stream bank 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 stream bank 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. **Willow mats** will be monitored annually and will be considered successful when the density of new willow stem re-vegetative growth achieves 50% aerial coverage after five years.
4. **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).

5. **Weed Control** will be based upon annual monitoring of the project area 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 State Listed noxious weed species within the site. This performance measure will be considered successful when Montana State-listed noxious weeds do not exceed 5% cover within the bank restoration and riparian planting zones.

Results of the third year monitoring at the Foy's Bend FCA are included in Section 4. In Section 5, the monitoring results for 2015 are compared to performance standards outlined in the Foy's Bend Monitoring Plan. Section 6 provides management recommendations to maximize the potential for meeting all performance standards at this mitigation site. Additional information including maps of the endpoints of riparian belt transects, stream bank surveys, vegetation communities and locations of noxious weed infestations; repeated survey results along the reconstructed bank segment of the Flathead River; photo documentation of the project site, and a planting schematic from the approved design, is provided as Appendices to this report.

2.0 SITE LOCATION

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

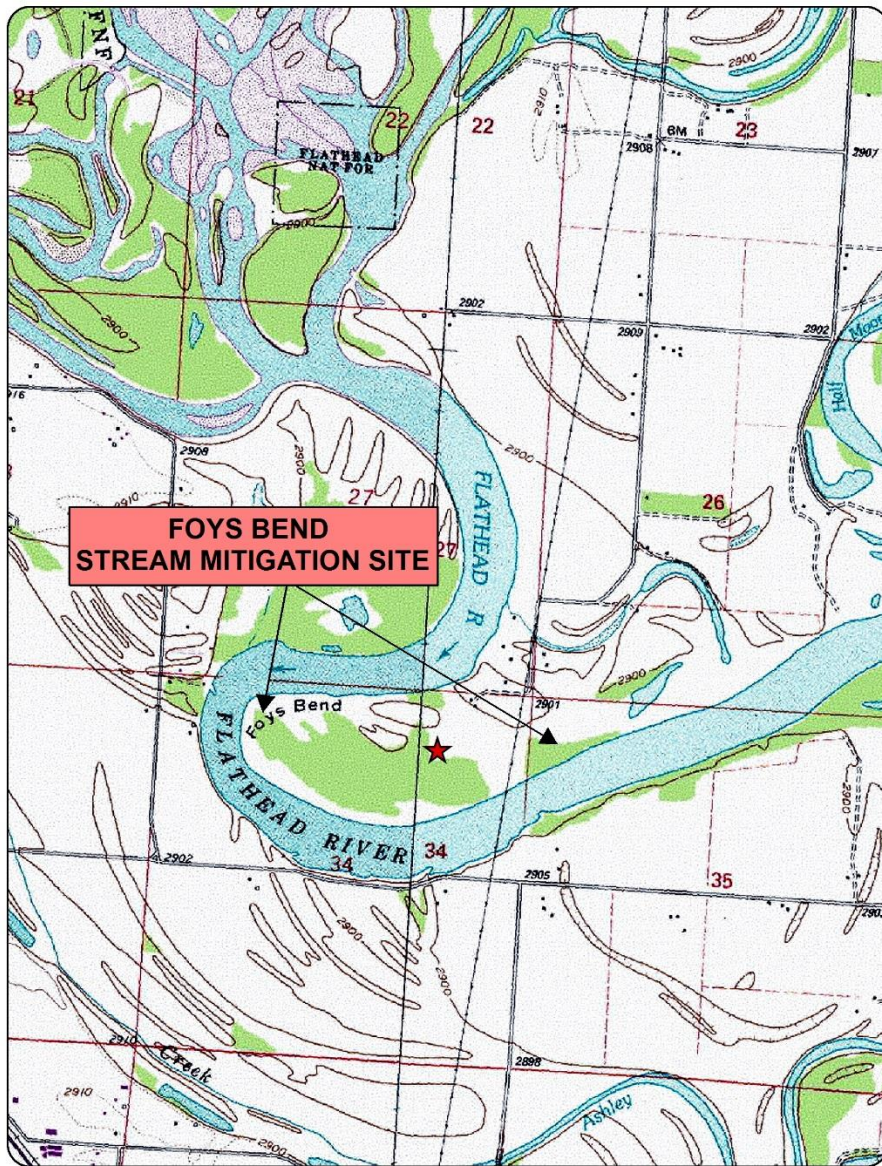


Figure 1. Project location of Foy's Bend Fisheries Conservation Area stream mitigation site.

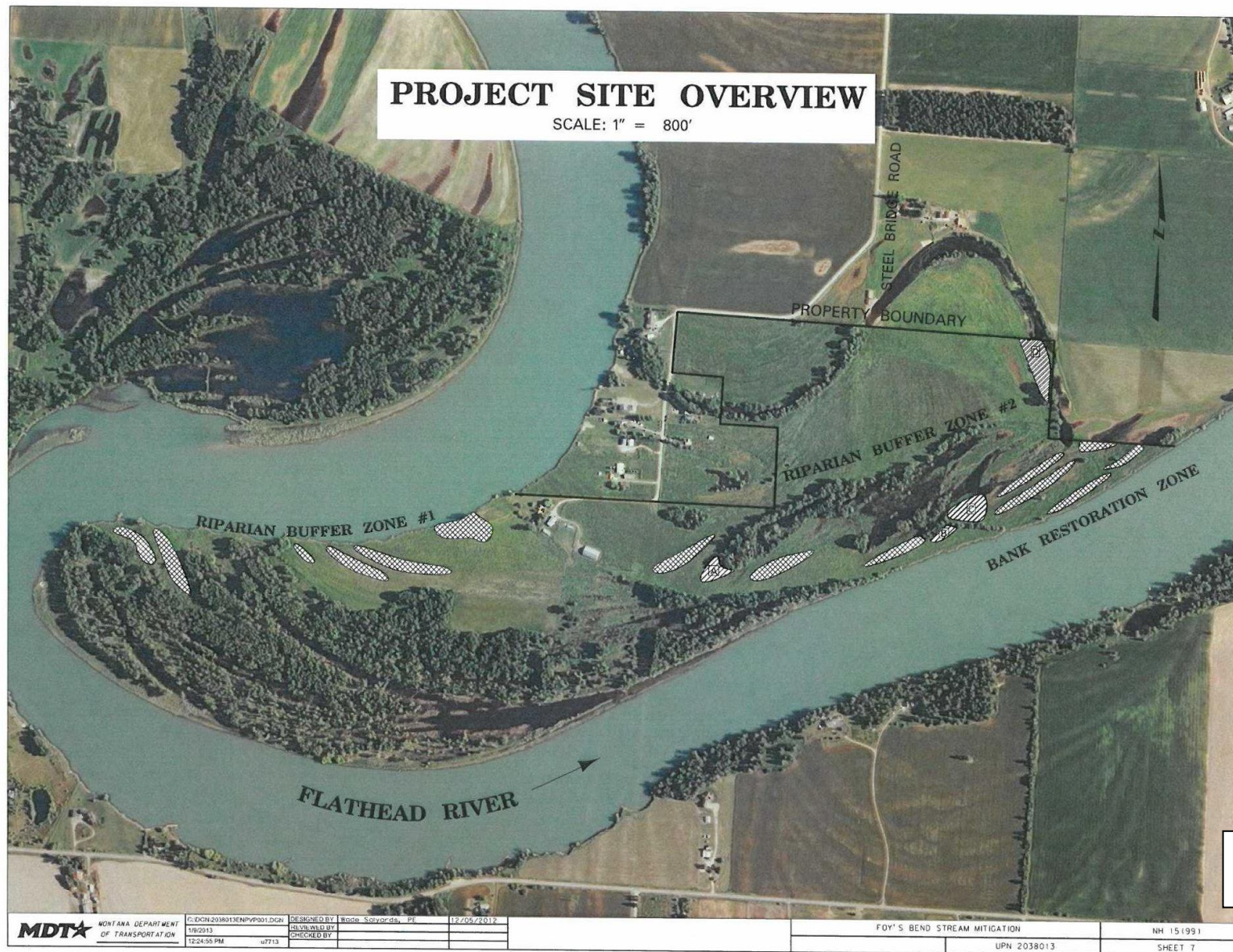


Figure 2. Detail of Foy's Bend Mitigation Site

3.0 MONITORING METHODS

The 2015 monitoring included two site visits to Foy's Bend. A spring site visit was conducted on March 18 to document conditions of the reconstructed bank segment while Flathead Lake levels remained below full pool. This site visit documented conditions of the reconstructed bank and areas below the bioengineered bank treatment during a time when this portion of the bank remained visible. Survey crews visited the site on April 21, 2015 to establish six new transects along the reconstructed bank segment and extend six of the previously established transects an additional 20 feet further into the river.

Monitoring field crews visited the project site again on August 19th and 20th, 2015 to collect vegetation monitoring data, while survey crews visited the site on August 25, 2015. The following data were collected at the Foy's Bend FCA stream mitigation site during the August site visit:

3.1. Vegetation Inventories

Four riparian belt transects, established in 2013, were re-assessed to document vegetation success, and included a 274 foot transect (T1) in exclosure #2, a 425 foot transect (T2) in exclosure #6, a 230 foot transect (T3) in exclosure #8, and a 275 foot transect (T4) in exclosure #18. The riparian transects included inventorying vegetation within a 25-foot wide belt centered by the transect alignment. Riparian transects T1 and T2 were conducted in exclosures planted with woody species per the mitigation plan. Riparian transect T3 was conducted in an exclosure that did not contain woody vegetation prior to mitigation, and was not planted with woody vegetation. Riparian transect T4 was conducted in an exclosure that included naturally occurring woody vegetation prior to mitigation, with no additional woody plantings installed. In addition to the four riparian transect inventories, dominant vegetation communities, percent cover by noxious weeds, and establishment by volunteer species was documented within all fenced exclosures.

A vegetation inventory was also conducted along one transect (T5) that ran parallel to the restored stream bank. The stream bank transect (T5) extended 1,350 feet and ran parallel to the Flathead River along the length of the reconstructed river bank. Data collection included areal percent cover of total vegetation, woody vegetation, and noxious weeds within a 10 foot wide belt along the entire 1,350-foot length of the reconstructed bank. The vegetation inventory included compiling a list of all plant species and their associated cover classes identified within 10 feet of the active channel. Percent cover of all species observed along the entire length of each bank was estimated and recorded using the following classification values: 0 (less than 1 percent), 1 (1 to 5 percent), 2 (6 to 10 percent), 3 (11 to 20 percent), 4 (21 to 50 percent), and 5 (greater than 50 percent). Stream bank community types were named based on the predominant vegetation species that characterized transect T5. Bank stability indices were assigned to the stream bank community types using Winward (2000) stability scores.

Areas within the fenced enclosures and along the restored bank were visually inspected to document the presence of noxious weeds. All noxious weed infestations were identified and mapped on aerial photographs, with species, cover class, and infestation extent noted. Observations of isolated noxious weed occurrences were included in the species lists and total areal percent cover estimate of noxious weeds within the project area, but were not mapped.

All fenced enclosures were visually inspected to document woody vegetation plantings. The inspection included recording the total number of live and dead woody plantings observed along each row of planted shrubs. A qualitative inspection of plantings was conducted to assess whether surviving plants were either thriving or showed signs of stunted growth due to either artificial and/or natural factors. The presence of volunteer woody vegetation within each enclosure was recorded with the species type and extent noted.

3.2. Stream Bank Surveys

Perpendicular bank transects were re-surveyed at the 14 locations established in 2013. During the April site visit, six additional perpendicular monitoring transects were established along the upper 300 feet of the reconstructed bank. The first new transect was located approximately 50 feet upstream of Transect #1, and is immediately upstream of the reconstructed bank segment. The remaining five new transects were positioned approximately half the distance between previously established Transects #1 – 6. All newly established transects, as well as Transects #1 - 6 were extended a minimum of 20 feet into the river to provide additional survey detail on the bank slope below the reconstructed, upper portion of the bank. The extended surveys also provided an opportunity to document any adjustments to the bank during rising lake levels in 2015. Results of all reconstructed bank transect surveys and a profile of the fascine installed along the bank are provided in Appendix B. Perpendicular bank transect #5 should not be confused with vegetation transect #5 (described in Section 3.1), which runs parallel to the reconstructed bank.

3.3. Fencing Inspections

All fencing placed by MDT was inspected for damage or wear. All fencing issues were photographed and locations documented on aerial maps. A list of all fencing maintenance concerns at Foy's Bend was provided to MDT on September 3, 2015.

3.4. 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.

3.5. Photo-Documentation

Photos were taken at all permanent photo documentation sites established during the 2013 monitoring event. Survey crews documented the reconstructed bank by taking photographs upstream, downstream, toward the bank, and toward the river at each

survey transect. All sites selected for photo-documentation were recorded on field maps with headings noted to allow for repetition during subsequent monitoring years.

3.6. Functional Assessment

A functional assessment of the riparian and stream bank areas was performed using the NRCS Proper Functioning Condition worksheets (NRCS 1998).

4.0 RESULTS

4.1. Riparian and Stream Bank Vegetation Inventory

Table 1 presents the vegetation cover results for the four riparian belt transects and single stream bank belt transect from 2013 to 2015. Transect locations are presented on Figures 4, 5, and 6 in Appendix A. Bare ground was not observed along three of the four riparian vegetation transects. It should be noted that the total percent cover of vegetation along the riparian transects included the presence of heavily matted litter from multiple grass species. This layer of litter comprised approximately 35-40% of the riparian transects surveyed in 2015.

Table 1. Percent cover of vegetation transects at the Foy's Bend stream mitigation site from 2013-2015.

Belt Transect	Location	Transect Type	Length (ft.)	Total % Vegetation Cover		
				2013	2014	2015
1	Exclosure 2	Riparian	274	100	100	100
2	Exclosure 6	Riparian	425	100	100	97
3	Exclosure 8	Riparian	230	100	100	100
4	Exclosure 18	Riparian	275	100	100	100
5	Stabilized river bank	Streambank	1350	63	85	95

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 4, 5, and 6 in Appendix A.

Transects 1 and 2 were considered representative of the 14 exclosures planted with woody vegetation. A length-based weighted average vegetation cover for these two transects (98%) was assigned to exclosures 1-7, 9, 10, and 13-17. Transect 3 was considered representative of the three exclosures with no woody vegetation, planted or native. The vegetation cover for transect 3 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 4 was located in the lone riparian exclosure (#18) that was not planted, but had naturally occurring woody vegetation within it prior to the mitigation project. This exclosure was also unique in that it was established by FWP for MDT prior to the

project. Therefore, the vegetation cover from transect 4 was considered representative of enclosure 18 only. Table 2 presents each riparian enclosure, its area in acres, and its assigned vegetation cover in areal cover percentage. As shown in Table 2, the area-weighted-average of total vegetation cover for all of the riparian enclosure areas on the project site is 98%. This overall weighted areal vegetation coverage in the riparian enclosures declined by 2% from previous monitoring results due to small areas of bare ground observed within enclosure #6. This enclosure was subject to extensive weed control efforts, which may have caused the minor decline in overall vegetation cover.

The vegetation belt transect along the stream bank (transect 5) was 1,350 feet long, 10 feet wide, and covered approximately 0.3 acres. It was aligned parallel and immediately adjacent to the Flathead River bank on the southern boundary of the project area (Figure 6, Appendix A). As shown in Table 1, total vegetation cover of the stream bank transect was 95%, representing an increase by 10% since the previous monitoring event in 2014 and 32% from observations recorded in 2013. Bare ground was primarily observed in areas where vegetation has not established through the coir blanket and in areas where soil has been stripped from the river-side edge of the coir wrapped bank (see Additional Photos 3, 4, and 6 on page C-5 of Appendix C). Table 3 presents a summary of vegetation cover for all riparian enclosures and stream bank transects combined.

Table 2. Enclosure size (acreage) and total percent riparian cover at the Foy's Bend stream mitigation site from 2013-2015.

Enclosure	Planted	Acres	Total % Vegetation Cover		
			2013	2014	2015
1	Yes	0.74	100%	100%	98%
2	Yes	1.06	100%	100%	98%
3	Yes	0.34	100%	100%	98%
4	Yes	0.87	100%	100%	98%
5	Yes	1.20	100%	100%	98%
6	Yes	1.23	100%	100%	98%
7	Yes	0.93	100%	100%	98%
8	No	0.56	100%	100%	100%
9	Yes	1.16	100%	100%	98%
10	Yes	0.67	100%	100%	98%
11	No	0.26	100%	100%	100%
12	No	0.91	100%	100%	100%
13	Yes	0.75	100%	100%	98%
14	Yes	0.89	100%	100%	98%
15	Yes	0.55	100%	100%	98%
16	Yes	0.41	100%	100%	98%
17	Yes	0.34	100%	100%	98%
18	No	1.22	100%	100%	100%
Total		14.1	100%	100%	98%

Table 3. Area weighted average of vegetation areal cover for riparian and stream bank transects at the Foy's Bend stream mitigation site from 2013-2015.

Area Type	Acres	Total % Vegetation Cover		
		2013	2014	2015
Riparian Enclosures	14.1	100%	100%	98%
Streambank	0.3	69%	85%	95%
Total	14.4	99.3%	99.7%	98.3%

Table 4 is a comprehensive list of plant species identified within the riparian enclosures at the Foy's Bend stream mitigation site from 2013 through 2015. In 2015, 118 species were observed, representing an increase by 22 species from 2014 and 56 species from the initial monitoring event in 2013. In 2015, 50% of the species identified on site were hydrophytic based on the 2014 National Wetland Plants Lists (NWPL) (Lichvar *et al.*, 2014).

4.2. Stream Bank Vegetation Composition

In 2015, 48 plant species were observed along the reconstructed stream bank (Table 5). Reed canary grass (*Phalaris arundinacea*) comprised greater than 50% cover along the stream bank, with lesser cover (21 to 50 percent) provided by spreading bent (*Agrostis stolonifera*). The Winward stability ratings are based on vegetation communities rather than individual species; therefore, a vegetation community was assigned to the stream bank based on one or more dominant species (Winward, 2000). If the community type was defined by one or more dominant species, the more dominant species stability rating was reported. Success criteria outlined in the monitoring plan state the vegetation along the stream banks will be considered successful when banks are vegetated with a majority of deep-rooting riparian plant species having root stability indices ≥ 6 . While spreading bent, with an associated stability index of 3, represented between 21 and 50 percent of the stream bank, reed canary grass, with an associated stability index of 9, dominated the majority (more than 50%) of the vegetation along the reconstructed bank.

Table 4. Comprehensive list of plant species identified within riparian exclosures at the Foy's Bend stream mitigation site from 2013- 2015.

Scientific Name	Common Name	WMVC Indicator Status*	Scientific Name	Common Name	WMVC Indicator Status*
<i>Achillea millefolium</i>	Common Yarrow	FACU	<i>Juncus effusus</i>	Lamp Rush	FACW
<i>Agastache urticifolia</i>	Nettle-Leaf Giant-Hyssop	FACU	<i>Juncus ensifolius</i>	Dagger-Leaf Rush	FACW
<i>Agropyron</i> sp.	Wheatgrass	NL	<i>Juncus</i> sp.	Rush	NL
<i>Agrostis gigantea</i>	Black Bent	FAC	<i>Juncus tenuis</i>	Lesser Poverty Rush	FAC
<i>Agrostis stolonifera</i>	Spreading Bent	FAC	<i>Kochia scoparia</i>	Mexican Kochia	NL
<i>Alnus incana</i>	Speckled Alder	FACW	<i>Lactuca serriola</i>	Prickly Lettuce	FACU
<i>Alopecurus aequalis</i>	Short-Awn Meadow-Foxtail	OBL	<i>Lemna minor</i>	Common Duckweed	OBL
<i>Alopecurus arundinaceus</i>	Creeping Meadow-Foxtail	FAC	<i>Leucanthemum vulgare</i>	Ox-Eye Daisy	FACU
<i>Alopecurus pratensis</i>	Field Meadow-Foxtail	FAC	<i>Linaria vulgaris</i>	Butter-and-eggs	NL
<i>Alyssum alyssoides</i>	Pale Alyssum	NL	<i>Maianthemum stellatum</i>	Starry False Solomon's-Seal	FAC
<i>Apocynum cannabinum</i>	Indian-Hemp	FAC	<i>Medicago lupulina</i>	Black Medick	FACU
<i>Arctium lappa</i>	Greater Burdock	NL	<i>Medicago sativa</i>	Alfalfa	UPL
<i>Arctium minus</i>	Lesser Burdock	UPL	<i>Mellilotus albus</i>	White Sweetclover	NL
<i>Asclepias</i> sp.	Milkweed	NL	<i>Mellilotus officinalis</i>	Yellow Sweet-Clover	FACU
<i>Asparagus officinalis</i>	Asparagus	FACU	<i>Mentha arvensis</i>	American Wild Mint	FACW
<i>Asperugo procumbens</i>	German-Madwort	UPL	<i>Pascopyrum smithii</i>	Western-Wheat Grass	FACU
<i>Aster</i> sp. (white rays)	Aster	NL	<i>Persicaria amphibia</i>	Water Smartweed	OBL
<i>Aster</i> sp. (purple rays)	Aster	NL	<i>Persicaria</i> sp.	Smartweed	NL
<i>Brassica juncea</i>	Chinese Mustard	UPL	<i>Phalaris arundinacea</i>	Reed Canary Grass	FACW
<i>Bromus inermis</i>	Smooth Brome	FAC	<i>Phleum pratense</i>	Common Timothy	FAC
<i>Carduus nutans</i>	Nodding Plumeless-Thistle	UPL	<i>Plantago lanceolata</i>	English Plantain	FACU
<i>Carex aquatilis</i>	Leafy Tussock Sedge	OBL	<i>Plantago major</i>	Great Plantain	FAC
<i>Carex bebbii</i>	Bebb's Sedge	OBL	<i>Poa palustris</i>	Fowl Blue Grass	FAC
<i>Carex nebrascensis</i>	Nebraska Sedge	OBL	<i>Poa pratensis</i>	Kentucky Blue Grass	FAC
<i>Carex pellita</i>	Woolly Sedge	OBL	<i>Polygonum</i> sp.**	Knotweed	NL
<i>Carex</i> sp.	Sedge	NL	<i>Populus angustifolia</i>	Narrow-Leaf Cottonwood	FACW
<i>Carex stipata</i>	Stalk-Grain Sedge	OBL	<i>Populus balsamifera</i>	Balsam Poplar	FAC
<i>Carex utriculata</i>	Northwest Territory Sedge	OBL	<i>Populus tremuloides</i>	Quaking Aspen	FACU
<i>Carex vesicaria</i>	Lesser Bladder Sedge	OBL	<i>Potentilla anserina</i>	Silverweed	OBL
<i>Carum carvi</i>	Caraway	FACU	<i>Potentilla recta</i>	Sulphur Cinquefoil	NL
<i>Chamerion angustifolium</i>	Fireweed	NL	<i>Prunus virginiana</i>	Choke Cherry	FACU
<i>Chenopodium album</i>	Lamb's-Quarters	FACU	<i>Rosa woodsii</i>	Woods' Rose	FACU
<i>Chenopodium leptophyllum</i>	Narrow-Leaf Goosefoot	FACU	<i>Rumex crispus</i>	Curly Dock	FAC
<i>Chenopodium rubrum</i>	Red Goosefoot	FACW	<i>Rumex fueginus</i>	Tierra del Fuego Dock	FACW
<i>Cirsium arvense</i>	Canadian Thistle	FAC	<i>Rumex salicifolius</i>	Willow Dock	FACW
<i>Cirsium vulgare</i>	Bull Thistle	FACU	<i>Salix bebbiana</i>	Gray Willow	FACW
<i>Convolvulus arvensis</i>	Field Bindweed	NL	<i>Salix exigua</i>	Narrow-Leaf Willow	FACW
<i>Coreopsis tinctoria</i>	Golden Tickseed	FACU	<i>Salix</i> sp.	Willow	NL
<i>Cornus alba</i>	Red Osier	FACW	<i>Schoenoplectus acutus</i>	Hard-Stem Club-Rush	OBL
<i>Crataegus douglasii</i>	Black Hawthorn	FAC	<i>Scirpus microcarpus</i>	Red-Tinge Bulrush	OBL
<i>Cynoglossum officinale</i>	Gypsy-Flower	FACU	<i>Scirpus</i> sp.	Bulrush	NL
<i>Dactylis glomerata</i>	Orchard Grass	FACU	<i>Shepherdia argentea</i>	Silver Buffalo-Berry	FACU
<i>Descurainia sophia</i>	Herb Sophia	NL	<i>Silene vulgaris</i>	Maiden's-tears	NL
<i>Elaeagnus commutata</i>	American Silver-Berry	FAC	<i>Solanum dulcamara</i>	Climbing Nightshade	FAC
<i>Eleocharis palustris</i>	Common Spike-Rush	OBL	<i>Solidago canadensis</i>	Canadian Goldenrod	FACU
<i>Elymus canadensis</i>	Nodding Wild Rye	FAC	<i>Sonchus arvensis</i>	Field Sow-Thistle	FACU
<i>Elymus hispidus</i>	Intermediate Wheatgrass	NL	<i>Sporobolus airoides</i>	Alkali-Sacaton	FAC
<i>Elymus repens</i>	Creeping Wild Rye	FAC	<i>Symphoricarpos albus</i>	Common Snowberry	FACU
<i>Elymus trachycaulus</i>	Slender Wild Rye	FAC	<i>Symphyotrichum ascendens</i>	Western American-Aster	FACU
<i>Epilobium ciliatum</i>	Fringed Willowherb	FACW	<i>Symphyotrichum laeve</i>	Smooth Blue American Aster	FACU
<i>Equisetum arvense</i>	Field Horsetail	FAC	<i>Tanacetum vulgare</i>	Common Tansy	FACU
<i>Equisetum hyemale</i>	Tall Scouring-Rush	FACW	<i>Taraxacum officinale</i>	Common Dandelion	FACU
<i>Geum macrophyllum</i>	Large-Leaf Avens	FAC	<i>Thlaspi arvense</i>	Field Pennycress	UPL
<i>Glyceria grandis</i>	American Manna Grass	OBL	<i>Tragopogon dubius</i>	Meadow Goat's-beard	NL
<i>Heracleum lanatum</i>	Cow-Parsnip	NL	<i>Trifolium pratense</i>	Red Clover	FACU
<i>Hordeum jubatum</i>	Fox-Tail Barley	FAC	<i>Trifolium repens</i>	White Clover	FAC
<i>Juncus balticus</i>	Baltic Rush	FACW	<i>Typha angustifolia</i>	Narrow-Leaf Cat-Tail	OBL
<i>Juncus bufonius</i>	Toad Rush	FACW	<i>Typha latifolia</i>	Broad-Leaf Cat-Tail	OBL
<i>Juncus compressus</i>	Round-Fruit Rush	OBL	<i>Verbascum thapsus</i>	Great Mullein	FACU

*Based on 2014 NWPL (Lichvar et al., 2014)

** Not Japanese Knotweed; likely *Polygonum aviculare*
New species identified in 2015 are **bolded**.

Table 5. Vegetation species observed along the reconstructed bank of the Flathead River in 2015.

Streambank Species	WMVC Indicator Status**	Streambank Species	WMVC Indicator Status**
<i>Agrostis stolonifera</i> *	FAC	<i>Linaria vulgaris</i>	NL
<i>Apocynum cannabinum</i>	FAC	<i>Medicago lupulina</i>	FACU
Bare Ground	NL	<i>Mentha arvensis</i>	FACW
<i>Bromus inermis</i>	FAC	<i>Phalaris arundinacea</i> *	FACW
<i>Carex nebrascensis</i>	OBL	<i>Poa palustris</i>	FAC
<i>Carex pellita</i>	OBL	<i>Poa pratensis</i>	FAC
<i>Carex sp.</i>	NL	<i>Populus angustifolia</i>	FACW
<i>Carex stipata</i>	OBL	<i>Populus balsamifera</i>	FAC
<i>Carex utriculata</i>	OBL	<i>Populus tremuloides</i>	FACU
<i>Chenopodium rubrum</i>	FACW	<i>Potentilla anserina</i>	OBL
<i>Cirsium arvense</i>	FAC	<i>Rumex crispus</i>	FAC
<i>Cornus alba</i>	FACW	<i>Rumex salicifolius</i>	FACW
<i>Crataegus douglasii</i>	FAC	<i>Salix bebbiana</i>	FACW
<i>Cynoglossum officinale</i>	FACU	<i>Salix exigua</i>	FACW
<i>Eleocharis palustris</i>	OBL	<i>Schoenoplectus acutus</i>	OBL
<i>Elymus repens</i>	FAC	<i>Scirpus microcarpus</i>	OBL
<i>Epilobium ciliatum</i>	FACW	<i>Shepherdia argentea</i>	FACU
<i>Equisetum arvense</i>	FAC	<i>Solidago canadensis</i>	FACU
<i>Glyceria grandis</i>	OBL	<i>Sonchus arvensis</i>	FACU
<i>Juncus balticus</i>	FACW	<i>Symphotrichum ascendens</i>	FACU
<i>Juncus bufonius</i>	FACW	<i>Taraxacum officinale</i>	FACU
<i>Juncus ensifolius</i>	FACW	<i>Trifolium pratense</i>	FACU
<i>Juncus tenuis</i>	FAC	<i>Typha angustifolia</i>	OBL
<i>Lactuca serriola</i>	FACU	<i>Verbascum thapsus</i>	FACU

*Indicates the dominant species observed.

**Based on 2014 NWPL (Lichvar et al., 2014)

The vegetation community type for each of the exclosure areas is presented on Figures 7, 8, and 9 in Appendix A. Nine main vegetation community types were identified on site in 2015, including:

- Type 1 – *Phalaris arundinacea*/*Poa pratensis*
- Type 2 – *Populus* spp.
- Type 4 – *Alopecurus arundinaceus*/*Poa pratensis*
- Type 5 – *Bromus inermis*/*Symphoricarpos albus*
- Type 6 – *Phalaris arundinacea*/*Symphoricarpos albus*
- Type 7 – *Poa pratensis*/*Dactylis glomerata*
- Type 8 – *Bromus inermis*/*Poa pratensis*
- Type 9 – *Phalaris arundinacea*
- Type 10 – *Schoenoplectus acutus*/*Phalaris arundinacea*

Vegetation community Type 1 – *Phalaris arundinacea*/*Poa pratensis* was identified in 17 of the 18 riparian exclosures in 2013 and 2014. In 2015, this community was observed

in only three riparian exclosures (6, 15, and 18) due to a shift in species composition and their associated cover classes.

Vegetation community Type 2 – *Populus* spp. was identified in riparian exclosures 1, 6, and 18 from 2013 through 2015. In 2015, this community was also observed in the southwestern corner of exclosure 17.

Vegetation community Type 4 – *Alopecurus arundinaceus*/*Poa pratensis* was identified in riparian exclosure 4 from 2013 through 2015.

Vegetation community Type 5 – *Bromus inermis*/*Symphoricarpos albus* was first observed in 2015 in riparian exclosure 2. Vegetation community Type 1 – *Phalaris arundinacea*/*Poa pratensis* was identified in exclosure 2 in 2013 and 2014. The change in community type represents the shift in vegetation cover from a dominance of reed canary grass (*Phalaris arundinacea*) and Kentucky blue grass (*Poa pratensis*) to smooth brome (*Bromus inermis*) and common snowberry (*Symphoricarpos albus*).

Vegetation community Type 6 – *Phalaris arundinacea*/*Symphoricarpos albus* was first identified in 2015 in riparian exclosures 1 and 12. Vegetation community Type 1 – *Phalaris arundinacea*/*Poa pratensis* was identified in exclosures 1 and 12 in 2013 and 2014. The change in community type represents the shift in vegetation cover from a dominance of Kentucky blue grass to common snowberry.

Vegetation community Type 7 – *Poa pratensis*/*Dactylis glomerata* was first observed in 2015 in riparian exclosures 5, 7, 8, 9, 10, and 11. Vegetation community Type 1 – *Phalaris arundinacea*/*Poa pratensis* was identified in these exclosures in 2013 and 2014. The change in community type represents the shift in vegetation cover from a dominance of reed canary grass to orchard grass (*Dactylis glomerata*).

Vegetation community Type 8 – *Bromus inermis*/*Poa pratensis* spp. was first identified in 2015 in riparian exclosures 3 and 18. Vegetation community Type 1 – *Phalaris arundinacea*/*Poa pratensis* was identified in these exclosures in 2013 and 2014. The change in community type represents the shift in vegetation cover from a dominance of reed canary grass to smooth brome.

Vegetation community Type 9 – *Phalaris arundinacea* was first observed in 2015 in riparian exclosures 13, 14, 16, and 17. Vegetation community Type 1 – *Phalaris arundinacea*/*Poa pratensis* was identified in these exclosures in 2013 and 2014. The change in community type represents the decrease in cover by Kentucky blue grass and overall dominance by reed canary grass.

Vegetation community Type 10 – *Schoenoplectus acutus*/*Phalaris arundinacea* was first identified in 2015 in the northwestern portion of riparian exclosure 18. This community replaced community Type 3 – *Carex* spp./*Typha latifolia* due to a shift in species composition and their associated cover classes, from a dominance of sedges (*Carex*

spp.) and broad-leaf cat-tail to hard-stem club-rush (*Schoenoplectus acutus*) and reed canary grass.

4.3. Noxious Weed Inventory

Forty-two infestations of five Montana Listed Priority 2B noxious weeds were identified and mapped within the Foy's Bend stream mitigation site during the 2015 monitoring event (Table 6). Noxious weed occurrences are displayed on Figures 7 through 9 in Appendix A with the exception of those observed in trace amounts, which were not mapped. Each mapped noxious weed occurrence was identified in areas less than 0.1 acre to 1.0 acre in size with cover classes ranging from low (1 to 5 percent) to high (26 to 100 percent). This method of mapping weed infestations differed from the 2013 and 2014 monitoring reports, which only mapped and reported infestations that were greater than 5% of the area of each exclosure. Overall areal noxious weed coverage reported in 2013 and 2014 did not include infestations less than 5% of the area of each exclosure; therefore results for noxious weed coverage for these years may have been under reported. Table 7 provides an estimate of percent cover by noxious weeds within each riparian and stream bank exclosure, indicating approximately 8.7% of the mitigation site has been colonized by noxious weeds. Weed spraying occurred on site in June 2014 and again in July 2015 and will continue as part of a joint MDT-MFWP weed management program for the site. Weed control efforts conducted in July 2015, prior to the August 2015 monitoring event, were concentrated in areas of infestation by the five noxious weed species observed on site. While at least 50% of the weed infestations treated with herbicide throughout the site in 2015 were successfully eradicated, total cover of noxious weeds increased due to the difference in reporting methods used in 2015.

Table 6. Montana State listed noxious weeds and regulated species observed in 2015 at the Foy's Bend Stream Mitigation site.

Category*	Scientific Name	Common Name
Priority 2B	<i>Cirsium arvense</i>	Canadian Thistle
	<i>Cynoglossum officinale</i>	Gypsy-Flower
	<i>Leucanthemum vulgare</i>	Ox-Eye Daisy
	<i>Linaria vulgaris</i>	Butter-and-eggs
	<i>Tanacetum vulgare</i>	Common Tansy

*Based on the Montana Department of Agriculture's Noxious Weed List, 2015

Table 7. Percent noxious weed coverage at the Foy's Bend stream mitigation site in 2015.

Exclosure #	Exclosure Acreage	% Cover of Exclosure by Noxious Weeds 2015	Acreage of Noxious Weeds
1	0.74	12	0.09
2	1.06	2	0.02
3	0.34	3	0.01
4	0.87	2	0.02
5	1.20	1	0.01
6	1.23	60	0.74
7	0.93	3	0.03
8	0.56	3	0.02
9	1.16	4	0.05
10	0.67	6	0.04
11	0.26	3	0.01
12	0.91	6	0.05
13	0.75	1	0.01
14	0.89	4	0.04
15	0.55	4	0.02
16	0.41	6	0.02
17	0.34	2	0.01
18	1.22	5	0.06
Stream Bank	0.30	5	0.02
Total Acreage	14.39		1.25
Total % Cover of Noxious Weeds at Foy's Bend:			8.72

4.4. Woody Vegetation Inventory

In 2015, the overall woody planting survival percentage dropped to 32%; a decrease from 68% observed during the 2014 monitoring event. Table 8 provides the total number of plants observed, and how many of those were either alive or stunted within each riparian exclosure in 2015, as well as planted woody vegetation survival rates observed during the past three monitoring events. In 2015, survival rates in each exclosure ranged from 18% - 64%. Survival rates dropped in all fenced areas, with only exclosure #10 exhibiting a survival rate above 50%. High mortality rates are likely due in part to vole herbivory, and may also have been due to herbicide treatment exposure.

Table 8. 2015 planted woody vegetation inventory and survival rates for 2013-2015.

Exclosure Number	Planted (Y/N)	Total Plants Inspected (2015)	# of Healthy Plants (2015)	# of Stunted Plants (2015)	% Stunted Plants (2015)	% Survival		
						2013	2014	2015
1	Y	245	68	32	32%	96%	74%	41%
2	Y	362	53	12	18%	70%	60%	18%
3	Y	119	18	5	22%	92%	56%	19%
4	Y	351	49	51	51%	97%	60%	28%
5	Y	454	69	18	21%	97%	56%	19%
6	Y	346	34	52	60%	84%	76%	25%
7	Y	456	27	79	75%	88%	57%	23%
9	Y	453	177	34	16%	92%	75%	47%
10	Y	223	100	42	30%	97%	85%	64%
13	Y	238	57	40	41%	93%	69%	41%
14	Y	297	52	57	52%	95%	76%	37%
15	Y	156	13	21	62%	97%	69%	22%
16	Y	84	11	14	56%	96%	61%	30%
17	Y	91	25	14	36%	99%	65%	43%
Total		3875	753	471	38%	91%	68%	32%

Table 9 provides a summary of percent cover by volunteer woody vegetation growth within each of the 18 exclosures in 2014 and 2015. Between 2014 and 2015, percent cover of volunteer woody species increased in six of the exclosures, decreased in six of the exclosures, and remained constant in six of the exclosures.

Table 9. Observed volunteer plant species establishment at the Foy's Bend FCA in 2014 and 2015.

Exclosure Number	Planted (Y/N)	% Cover by Volunteers		Symphoricarpos albus	Rosa woodsii	Populus angustifolia	Populus tremuloides	Prunus virginiana
		2014	2015					
1	Y	30%	40%	X	X			
2	Y	10%	50%	X	X	X		
3	Y	5%	3%				X	
4	Y	0%	0%					
5	Y	0%	0%					
6	Y	20%	10%				X	
7	Y	1%	5%				X	
8	N	1%	1%				X	
9	Y	5%	1%				X	
10	Y	25%	20%				X	
11	N	15%	30%				X	
12	N	20%	25%	X			X	
13	Y	0%	0%					
14	Y	0%	0%					
15	Y	1%	0%					
16	Y	1%	0%					
17	Y	5%	5%				X	
18	N	5%	23%			X	X	X

4.5. Stream Bank Performance

For the purposes of describing the reconstructed bank segment, it has been divided into three reaches based on conditions observed and surveys conducted during the April, 2015 site visit (Figure 3). The following sections describe monitoring data documented within each of the three reaches as well as immediately upstream of the reconstructed bank. Supporting data includes plotted survey transect data (Appendix B) and photo documentation of the river bank (Appendix C). Perpendicular bank transects plotted at each of the locations shown in Figure 3 also includes the elevation at the top of the fascine during the August, 2015 survey event.

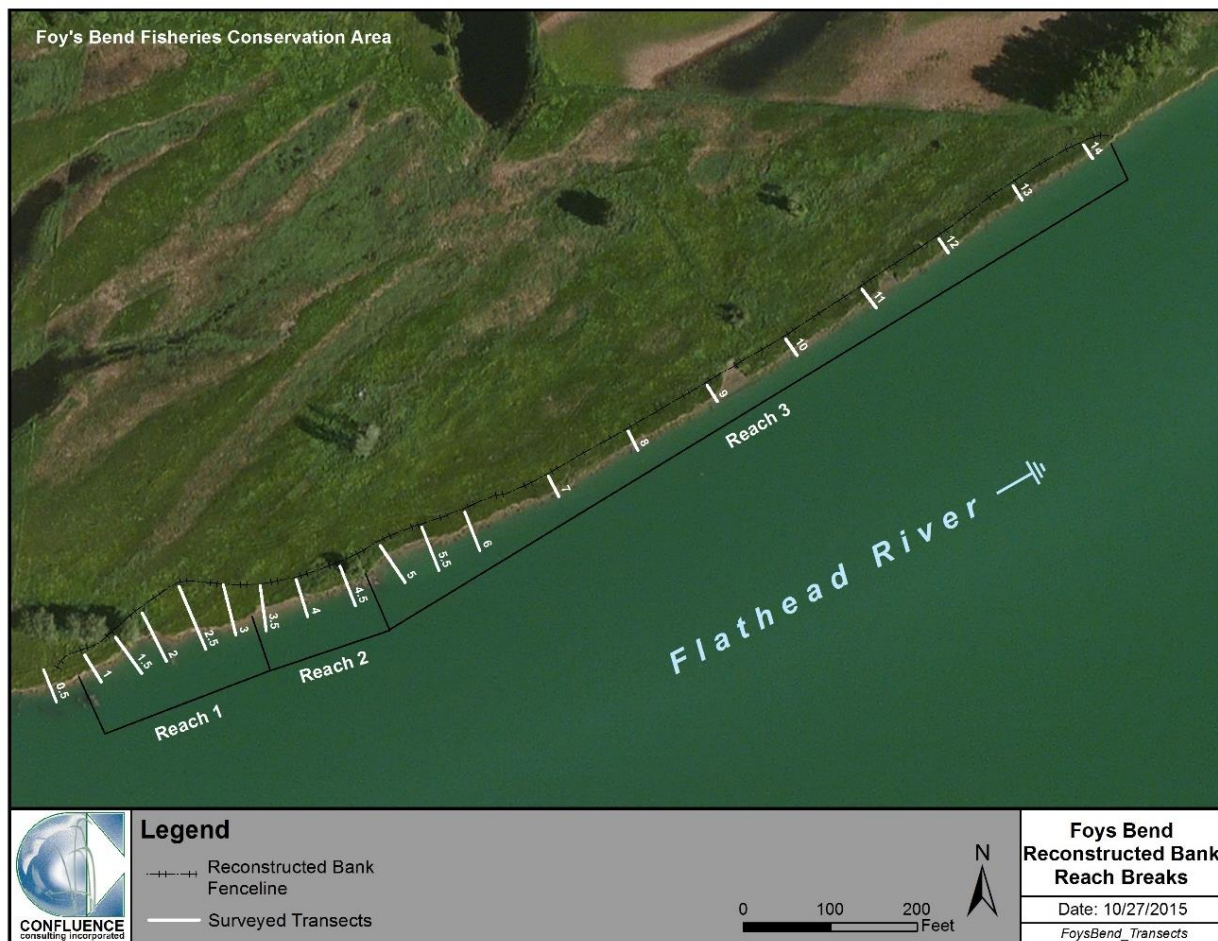


Figure 3. Reach breaks and surveyed transects along Foy's Bend reconstructed bank segment.

4.5.1. Upstream of Reconstructed Bank Segment

Monitoring of the bank upstream of the stabilization project has included photo-documentation and surveying of perpendicular bank transect #0.5. The following points summarize conditions immediately upstream of the reconstructed bank segment:

- Photos taken in 2013 and 2015 at photo point 5.1 (see page C-3 in Appendix C) reveal the river bank upstream of the reconstructed bank segment has eroded

northward, with evidence provided by wooden fence posts formerly at the top of the bank that have since fallen in the river. Given the bank retreat observed over the past two years and documented by survey transect #0.5 during the past year, erosion severity along this bank is considered severe. The erosion occurring along this bank segment has yet to affect the reconstructed bank area other than calving of the bank where fence posts were installed to establish the upstream extent of an enclosure. However, continued erosion of the river bank upstream of the stabilized reach may threaten the MDT project area if the erosion begins to flank the coir wrapped banks.

- Inspection of survey results at perpendicular transect #0.5 indicate the bank retreated approximately two feet near the high water surface elevation between April and August; however, the top of the bank remained in place (see bank profile, page B-1, Appendix B).
- Although the top of the bank did not migrate, the upper bank now appears more susceptible to erosion due to the steep bank angle, fine grained materials, and lack of deep binding roots (see photo looking upstream from Transect #0.5 on page C-9 of Appendix C).
- Other than a short segment of the bank that has been riprapped, active bank erosion extends approximately 775 feet upstream of the reconstructed bank segment.

4.5.2. Reconstructed Bank Segment – Reach 1

Reach 1 includes the upper (western) 235 feet of the reconstructed bank, which begins near the southwestern extent of the protective fencing. Perpendicular bank transects #1 through #3 lie within Reach 1. The following points describe bank conditions documented within Reach 1:

- The upper, re-sloped portion of the reconstructed bank above the bioengineered treatment appears stable with no indication of lateral erosion (see Photo Point 5.2, page C-3, Appendix C).
- Vegetation along upper bank is dominated by reed canary grass (*Phalaris arundinacea*) and a diversity of sedges, grasses and forbs, with a lesser cover provided by a variety of planted shrubs. New willow growth was noted along the riverward face of the revegetated soil lift in 2015.
- Soil placed along the outer (river-side) edge of the coir lift has been stripped from the lift throughout length of Reach 1. Soil loss stopped at the upper limit of a clearly defined debris line formed by wave action. Soil loss was estimated at 6" based on the design thickness of the soil lift (see Additional Photo 3 and 4 on page C-5 in Appendix C).
- The fascine below the soil lift is lower than the design elevation (and assumed construction elevation) by up to 1.3 feet within Reach 1, which may be a result of compaction or decomposition of the fascine and/or slope failure beneath the fascine (see profile of fascine surveyed in August, 2015 on page 21 of Appendix B and photo of fascines on page C-13 in Appendix C). Slope failure below the fascines is likely the main contributing factor to the drop in fascine elevation.

- The maximum bank retreat at the elevation of the fascine within Reach 1 is approximately 1.25 feet since 2013; however, this retreat is attributed to soil loss and slumping of the fascine and soil lift rather than from active lateral erosion of the reconstructed bank.
- Surveys of the bank below the bioengineered treatment indicate lateral erosion by up to three feet in some areas (e.g. @ Transect 2.5). Continued lateral bank movements along the lower bank threaten the stability of the upper, resloped and revegetated bank areas due to the potential for erosion to undermine beneath the willow fascines and coir soil lifts.
- Deposition has also been noted below the bioengineered bank treatment, indicating lateral migration toward the stabilized bank is not necessarily occurring along the entire length of the stabilized bank.

4.5.3. Reconstructed Bank Segment – Reach 2

Reach 2 includes 135 feet of the reconstructed bank downstream of Reach 1. Monitoring of this reach included photo documentation and surveys at perpendicular bank transects #3.5, #4, and #4.5. The following points describe bank conditions documented within Reach 2:

- The upper, re-sloped portion of the reconstructed bank above the soil lift appears stable with no indication of lateral erosion (see Photo Points 6.1 and 6.2 on pages C-3 and C-4 in Appendix C).
- Vegetation along the upper bank is dominated by reed canarygrass (*Phalaris arundinacea*) and a diversity of sedges, grasses and forbs, with a lesser cover provided by a variety of planted shrubs. New willow growth was noted along the riverward face of the revegetated soil lift in 2015.
- Soil placed along the outer (river-side) edge of the coir lift has been stripped from the lift throughout length of Reach 2. Soil loss stopped at the upper limit of a clearly defined debris line formed by wave action during high water. Soil loss was estimated at 6" based on the design thickness of the soil lift (see Photo Point 6.1 on Page C-4 in Appendix C).
- Visual observations during April 2014 noted significant soil loss below the bioengineered bank treatment, which had undermined approximately 50 feet of the fascine placed below the soil lift.
- Visual observations in March 2015 noted additional soil loss from beneath the bioengineered bank treatment as evidenced by the coir fascine and soil lift slumping into the river at low water (see fascine profile in Appendix B and Additional Photos 9 and 10 on page C-6 of Appendix C).
- Survey transects indicate the elevation of the fascine through Reach 2 has dropped between 1 and 3 feet below the design elevation (and assumed construction elevation) due to soil loss from beneath the bioengineered treatment (see profile of fascine surveyed in August, 2015 on page B-21 in Appendix B).
- The maximum bank retreat at the elevation of the fascine within Reach 2 is approximately one foot since 2013; however, this retreat is attributed to soil loss

and slumping of the fascine and soil lift rather than from active lateral erosion of the reconstructed bank.

- The slope of the bank between the low and high water elevations is steeper than the slope of the bioengineered bank treatment and the bank below the low water elevations. As a result, the bank segment between the low and high water elevations is prone to additional erosion and soil loss.

4.5.4. Reconstructed Bank Segment – Reach 3

Reach 3 includes the downstream 1,000 feet of the reconstructed bank. Monitoring of this reach includes photo documentation and surveys at perpendicular bank transects #5 through #14. The following points describe bank conditions documented within Reach 3:

- The upper, re-sloped portion of the reconstructed bank above the soil lift appears stable with no documentation of lateral erosion (See Photo Point 7, page C-4 in Appendix C).
- Vegetation along the upper bank is dominated by reed canarygrass (*Phalaris arundinacea*) and a diversity of sedges, grasses and forbs, with a lesser cover provided by a variety of planted shrubs. New willow growth was noted along the riverward face of the revegetated soil lift in 2015.
- Similar to observations in Reach 1 and 2, soil has been stripped from the leading edge of the coir lift throughout the length of Reach 3. Soil loss stopped at the upper limit of a clearly defined debris line formed by wave action during high water. Soil loss was estimated at 6" based on the design thickness of the soil lift (See photo point 6.2 on page C-4 of Appendix C). It does not appear water extends above this line during the summer months and vegetation has established well within the coir fabric to prevent any additional stripping and soil loss.
- At all perpendicular bank transects, the elevation of the fascine has dropped by less than one foot from the design elevation (and assumed construction elevation), and less than 0.5 feet at seven of the 11 transects. The fascine has dropped 0.8' and 0.7' at Transects #9 and #10, respectively (see profile of fascine surveyed in August, 2015 on page B-21 of Appendix B).
- Soil loss from beneath the bioengineered bank treatments has not been observed; however, surveys indicate the bank below the bioengineered treatment has retreated toward the bank at Transects #6, #7, #8, and #9.
- The bank slope immediately below the fascine has generally become steeper since 2013 along the length of Reach 3. The fluvial processes at play along the Flathead River that contribute to steepening of the lower bank at this location are not fully understood.
- Based on these observations, the bank stabilization treatment through Reach 3 remains at risk of failure due to lateral bank movement along the lower bank, albeit at a slower pace than that observed along Reach 2.

Over the course of the monitoring phase of the project, the following types of erosion have been observed, and are contributing to soil losses beneath the bioengineered bank treatment:

1. Internal Erosion: Piping losses of soil were observed in numerous locations during the April, 2014 monitoring site visit. Piping was evidenced by large voids and tunnels (pipes) within the bank soils. These pipes were oriented generally perpendicular to the slope but were somewhat serpentine.

Piping was observed in the restoration area at a greater frequency than in the unaltered, eroding bank upstream. This may have been caused by subtle differences in the soils along the treatment section, but more likely was the result of the upper treated bank being more stable and preventing collapse and covering up the pipes.

Internal erosion losses likely occurred during drawdown of the river in the fall. However, it is uncertain whether pipes formed in the fall would last until spring. Alternatively, pipes may have formed during snow melt and flow of meltwater through the fine sandy bank soils.

2. Rill Erosion: Rills were observed running perpendicular to the bank slope during the spring 2014 monitoring event, indicating recent erosion by surface runoff. This likely occurred during snow melt and rain events. Rills were also observed during the spring, 2015 event, although were less pronounced.
3. Wave Erosion: Waves were actively eroding the bank slope at the water surface. A small vertical scarp was observed at the erosional face. Height of the scarp ranged from a couple inches to a couple feet. Wave erosion was observed whenever wind speed increased above approximately 10 knots for more than a few minutes. Wind-caused wave erosion is expected to be significant during prolonged southwesterly winds, as the fetch is approximately 1 mile in length. Bank erosion was also observed when wakes from passing boats reached the shore. Three boats were observed traveling in the middle of the river that each caused collapse of the vertical erosion scarp during the site visit.
4. Mass Wasting: Mass slope failure was not observed but may have been obscured by high water. Mass failures were observed by Karin Boyd in this area while conducting a channel migration study of the Flathead River (AGI and DTM 2010).

Based on these observations, it is believed the most significant cause of bank erosion is wave action combined with river transport of eroded sediment and the change in water elevation associated with operation of Séliš Ksanka Ql'ispé Dam (formerly Séliš Ksanka Ql'ispé Dam). The general erosional process is described by:

- i. Wave action (wind and boat) cutting vertical scarp at the river water surface and depositing eroded material on the bank below the water line
- ii. River current transporting materials removed by the erosion scarp
- iii. Water level changes, leading to formation of new scarps at different elevations along the bank slope
- iv. Loss of sediments through river transport which prevent the formation of a stable slope

Monitoring of the bioengineered bank treatment along the Flathead River indicates stability of the bank is limited to the re-sloped and revegetated areas of the bank above the soil lift. The bank beneath the treatment shows signs of instability and migration between the low and high water surface elevations. Bank instability due to slope failure beneath the fascines has been documented in Reach 2.

4.5.5. *Fascine Inspections*

None of the fascines appear to be unravelling along the length of the reconstructed bank. As noted in the sections above describing Reaches 1-3, segments of the fascines have dropped in elevation by up to 3.1 feet below the design elevation due to a loss of bank material beneath them; however, they remain intact. All of the fascines are completely submerged during high water and all of the willow cuttings installed between the fascines and the coir wrapped soil lift have perished as a result of being submerged throughout the growing season.

4.6. Fencing Inspections

Fencing issues at eight locations were documented in 2015, and included broken zip ties causing the fence to sag, and torn fence segments. Photographs were taken and GPS points recorded at each fence failure location. Documentation of each fencing issue was provided to MDT within two weeks of the monitoring event.

4.7. Wildlife Documentation

Wildlife use documented at the Foy's Bend mitigation area from 2013 through 2015 includes 30 bird and four mammal species (Table 10). Eight bird and two mammal species were observed during the 2015 site visit.

4.8. Photo-Documentation

Photo documentation of the site was repeated at several photo points established during the 2013 monitoring event and at several other locations to document vegetation establishment and stream bank conditions within the project site (Appendix C). All sites selected for photo-documentation were recorded on field maps with headings noted to allow for repetition during subsequent monitoring years. Photos were also repeated 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.

Table 10. Wildlife observations at the Foy's Bend stream mitigation site from 2013-2015.

Common Name	Scientific Name
Birds	
American crow	<i>Corvus brachyrhynchos</i>
American robin	<i>Turdus migratorius</i>
Bald eagle	<i>Haliaeetus leucocephalus</i>
Belted kingfisher	<i>Megaceryle alcyon</i>
Black-billed magpie	<i>Pica hudsonia</i>
Black-capped chickadee	<i>Poecile atricapillus</i>
Canada goose	<i>Branta canadensis</i>
Common merganser	<i>Mergus merganser</i>
Common raven	<i>Corvus corax</i>
Dark-eyed junco	<i>Junco hyemalis</i>
Falcon	<i>Falco</i> sp.
Great blue heron	<i>Ardea herodias</i>
Great horned owl	<i>Bubo virginianus</i>
Gull sp.	<i>Laridae</i> family
House wren	<i>Troglodytes aedon</i>
Mallard	<i>Anas platyrhynchos</i>
Marsh wren	<i>Cistothorus palustris</i>
Mourning dove	<i>Zenaida macroura</i>
Northern flicker	<i>Colaptes auratus</i>
Osprey	<i>Pandion haliaetus</i>
Red-tailed hawk	<i>Buteo jamaicensis</i>
Ring-necked pheasant	<i>Phasianus colchicus</i>
Song sparrow	<i>Melospiza melodia</i>
Sparrow sp.	<i>Passer</i> sp.
Swainson's hawk	<i>Buteo swainsoni</i>
Swallow sp.	<i>Tachycineta</i> sp.
Tree swallow	<i>Tachycineta bicolor</i>
Western kingbird	<i>Tyrannus verticalis</i>
Western meadowlark	<i>Sturnella neglecta</i>
Woodpecker sp.	<i>Pickidae</i> family
Mammals	
Beaver (chews)	<i>Castor canadensis</i>
Coyote (scat)	<i>Canis latrans</i>
White-tailed deer	<i>Odocoileus virginianus</i>
Vole	<i>Arvicolinae</i> sp.

*New species observed in 2015 are **bolded**.

4.9. Proper Functioning Condition

The Foy's Bend monitoring plan requires a Proper Functioning Condition assessment during the third and final monitoring years. 2015 marks the third year of site monitoring following construction. Table 11 includes the riparian-wetland functional checklist and notes used to assign a functional rating. In order to assess the functional condition of the riparian and wetland areas using the PFC assessment methodology, conditions observed site-wide within the Foy's Bend FCA were used for the hydrology and

erosion/deposition categories, while conditions observed within the riparian and reconstructed stream bank exclosures were used for the vegetation category.

Based on the results of the PFC assessment, the site has been classified as **“Functional – at risk” with an upward trend**. Primary factors supporting this classification include:

- Hydrology of the Flathead River in the vicinity of the Foy's Bend FCA is profoundly affected by operation of 1) the Séliš Ksanka Ql'ispé Dam, which prolongs the period during which Flathead Lake remains at full pool and backwaters the Flathead River; and 2) Hungry Horse Dam, which reduces the frequency and magnitude of flood discharges in the Flathead River through the project reach.
- The modified hydrology resulting from Séliš Ksanka Ql'ispé Dam has resulted in widespread bank instability, which is evident along approximately half of the Flathead River bank within the Foy's Bend FCA.
- Re-sloped and revegetated areas along the reconstructed river bank are capable of maintaining stability along the upper bank; however the bioengineered treatment is not capable of stabilizing the lower bank between the high and low water surface elevations.
- Woody vegetation installed within the fenced exclosures will expand the extent and improve the function of riparian habitats within the Foy's Bend FCA in areas that have been historically managed for agricultural purposes.
- Although the woody vegetation installed within the riparian exclosures is currently young, it will eventually provide improved riparian function and a source of coarse woody material to the floodplain.
- Although the hydrologic factors at play along the Flathead River are negatively affecting the function of riparian and wetland habitats and overall channel stability, it is unlikely these conditions will worsen over time.
- Management of former agricultural areas within the Foy's Bend FCA is anticipated to improve riparian and wetland function over time.

Table 11. Proper Functioning Condition Worksheet (from Pritchard et al 1998)

YES	NO	N/A	HYDROLOGY*	NOTES
X			1. Floodplain above bankfull is inundated in "relatively frequent" events	Evidence of frequent overbank flooding exists along the far western end of the Foy's Bend FCA, and includes high flow swales and flood debris.
		X	2. Where beaver dams are present they are active and stable	No beaver dams were observed within the Foy's Bend FCA during monitoring of the MDT mitigation areas.
	X		3. Sinuosity, width/depth ratio and gradient are in balance with the landscape setting (i.e. landform, geology, and bioclimatic region)	The construction of Séliš Ksanka Ql'ispé Dam (formerly Kerr Dam) has dramatically affected the hydrology and channel of the Flathead River through the project reach. The effect of Séliš Ksanka Ql'ispé Dam and manipulation of Flathead Lake levels affects the project area by inundating the lower banks during the growing season and freezing/thawing of the lower banks during the non-growing season when lake levels are low. Lake level management at Séliš Ksanka Ql'ispé Dam has resulted in widespread channel instability, which is evident along lengthy segments of the river banks within the Foy's Bend FCA.
X			4. Riparian-wetland area is widening or has achieved potential extent	Riparian area widening within the Foy's Bend FCA is occurring as a result of management actions designed to expand riparian habitats that were formerly converted to agricultural production.
		X	5. Upland watershed is not contributing to riparian-wetland degradation	The Hungry Horse Dam has reduced the mean annual peak discharge of the Flathead River at Columbia Falls by over 10,000 cfs from pre-dam conditions. As a result of this dam construction, the floodplain, wetland, and riparian areas adjacent to the Flathead River within the Foy's Bend FCA are less frequently inundated.
YES	NO	N/A	VEGETATION**	NOTES
	X		6. There is diverse age-class distribution of riparian-wetland vegetation (recruitment for maintenance/recovery)	Woody vegetation, including a variety of trees and shrubs were planted within 14 of the 18 riparian exclosures and along the reconstructed river bank. These areas have yet to establish mature trees or shrubs, and exhibit only early seral vegetative growth. Other exclosures include mature stands of cottonwood and aspens, and are beginning to become colonized by volunteer growth.
X			7. There is diverse composition of riparian-wetland vegetation (for maintenance/recovery)	Vegetation surveys have identified 118 plant species within the riparian exclosures and reconstructed bank segment.
X			8. Species present indicate maintenance of riparian-wetland soil moisture characteristics	Of the 118 species identified within the riparian exclosures, 50% are classified as hydrophytic.
X			9. Streambank vegetation is comprised of those plants or plant communities that have root masses capable of withstanding high streamflow events	Vegetation surveys along the upper bank segment have identified 48 species along the reconstructed streambank. Of these, 30% have a stream bank stability score 6 or higher (out of 10) (Burton et al 2011). Although these vegetation communities appear to provide stability during high flows, they are unable to withstand erosion during low flows when the unvegetated portion of the banks are subject to freeze/thaw cycles and wave action from wind and boat traffic.
	X		10. Riparian-wetland plants exhibit high vigor	Riparian shrubs that have been installed within the fenced exclosures have shown low survival rates (32%). Survival rates were compromised by vole herbivory. Vegetation installed along the reconstructed river bank shows high vigor.
X			11. Adequate riparian-wetland vegetative cover is present to protect banks and dissipate energy during high flows	Vegetation surveys conducted in 2015 indicate approximately 90% of the riparian and stream bank areas are vegetated with desirable species.
	X		12. Plant communities are an adequate source of coarse and/or large woody material (for maintenance/recovery)	Woody vegetation installed within the riparian exclosures and along the reconstructed bank segment have yet to reach an age that is capable of providing coarse and/or large woody material.
YES	NO	N/A	EROSION/DEPOSITION*	NOTES
X			13. Floodplain and channel characteristics (i.e., rocks, overflow channels, coarse and/or large woody material) are adequate to dissipate energy	The Foy's Bend FCA exhibits several overflow channels, many of which have coarse woody debris. Floodplain development is particularly pronounced along the west side of the FCA.
X			14. Point bars are revegetating with riparian-wetland vegetation	The sole point bar on the far western end of the Foy's Bend FCA is well vegetated with wetland and riparian vegetation.
	X		15. Lateral stream movement is associated with natural sinuosity	Lateral stream movement is exacerbated by manipulation of Flathead Lake levels at the Séliš Ksanka Ql'ispé Dam.
X			16. System is vertically stable	A channel migration study conducted in 2010 does not suggest vertical instability along this reach of the Flathead River.
		X	17. Stream is in balance with the water and sediment being supplied by the watershed (i.e. no excessive erosion or deposition)	Excessive erosion has been noted along the bank of the Flathead River that abuts the Foy's Bend FCA. This erosion results from modified hydrology and manipulation of Flathead Lake levels, which backwater the Flathead River through the project reach.

*Based on site-wide conditions observed within the Foy's Bend FCA

** Based on conditions observed only within the riparian exclosures and reconstructed bank segment

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 post-construction monitoring plan for the site (Table 12). The third year of monitoring suggests three of the ten performance standards are currently being met. Data for percent cover of woody vegetation within each fenced enclosure will be collected during subsequent monitoring events.

5.1. Riparian Buffer Success

Vegetation monitoring of the riparian corridor and stream bank indicated 90% of disturbed areas have successfully revegetated with beneficial species following reconstruction of the river bank and installation of the riparian exclosures. Beneficial vegetative cover was determined by subtracting the percent cover of noxious weeds (8.7%) from the site's total vegetative cover (98%). Performance criteria specify at least 50% of the disturbed areas within the creditable buffer area must be vegetated with non-noxious weed species; therefore, this criterion is currently being met.

Monitoring of noxious weeds revealed six of the 18 exclosures exhibit noxious weed cover that exceeds the 5% threshold. Exclosure #6 was particularly infested, with approximately 60% areal coverage by noxious weeds. At least 50% of the weed infestations treated with herbicide throughout the site in July 2015 had been successfully eradicated. While the recent herbicide application has helped reduce the potential for further spread of noxious weeds; many infestations remain and continued control efforts are necessary to achieve the performance target. Overall, 8.7% of the revegetated areas exhibit noxious weeds, which exceeds the success criteria of 5% established in the monitoring plan.

5.1.1. Vegetation Success

Total combined areal vegetative cover of the riparian exclosures and the reconstructed river bank is currently 98% (98% of the exclosures and 95% of the river bank). Site-wide coverage of noxious weed species is currently 8.7%. The performance criterion for this category specifies $\geq 70\%$ of the combined riparian and stream bank vegetation communities must have desirable vegetative establishment. Currently, 90% of the revegetated areas exhibit desirable growth; therefore, this performance criteria is currently being met.

5.1.2. Woody Plants

Woody vegetation plantings indicated a survival percentage of 32% following the third growing season, indicating a substantial drop since 2014. The drop below the success threshold of 50% survival three years following installation of the woody vegetation indicates this criterion will not be met five years after the project was completed. The primary factor limiting survival is vole herbivory, although some shrubs perished due to their close proximity to herbicide applications. Volunteer species were observed in 12 of the 18 exclosures and ranged in percent coverage from 1% to 50% of the fenced area. Volunteer willows were observed along the stream bank, although their percent cover is limited due to their young age.

5.2. 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). Monitoring of the 14 bank profiles established in 2013 and six additional profiles established in 2015 indicated stabilization of the upper, re-sloped and revegetated area of the bioengineered bank is functioning as designed based on erosion rates of <1 foot per year.

Areas of the bank below the bioengineered treatment are eroding due to multiple causes that are acting to undermine the upper bank. Although the performance criteria for bank stability is currently being met, the bank is at risk of failure due to the instability caused by fluctuating lake levels, wave action created by boats and wind, river currents, and potentially mass wasting beneath the bioengineered treatments on the upper bank. Active bank erosion documented immediately upstream of the reconstructed bank segment also jeopardizes the long term stability of the bioengineered bank treatment.

A classification of "Functional – at risk" with upward trend was assigned to the overall wetland and riparian areas within the Foy's Bend FCA. The hydrologic factors that affect bank stability throughout this reach of the Flathead River are the primary causes for this area not receiving a "Functional" rating. It should be noted the hydrologic factors that lead to the "at risk" rating were not to be addressed as part of the MDT mitigation project at Foy's Bend, are not likely to be addressed in the near term, and are likely to continue limiting the success of bank stabilizing actions.

5.3. Willow Mats

Observations of the willow cuttings installed immediately above the fascine along the length of the reconstructed bank indicate this planting technique was unsuccessful. None of the willow cuttings survived, although some volunteer willows are growing up through the coir soil lift. The mortality of the willows installed along the fascine is likely a result of the cuttings being submerged throughout the duration of the growing season. Overall, approximately 1% of the reconstructed bank segment exhibits willow growth due to planted and volunteer establishment.

5.4. Vegetation along Stream bank

Reed canary grass comprised greater than 50% cover along the stream bank in 2015. While spreading bent, with an associated stability index of 3, accounted for 21 to 50% cover along the bank, reed canary grass was the dominant vegetation community observed, with an associated Winward stability rating of 9. Therefore, stream bank vegetation is successfully meeting the associated performance criteria.

Table 12. Comparison of results to performance criteria for the Foy's Bend mitigation site, 2015.

Parameter	Performance Standard	Status	Site Meeting Performance Criteria?
1. Riparian Buffer Success	Areas within creditable riparian buffer disturbed during construction must have 50% or greater areal cover of non-noxious weed species by the end of the monitoring period	17 of 18 riparian exclosures exhibit >80% cover of non-noxious weed species. Overall, the riparian exclosures exhibit 90% cover by non-weedy species	YES
	Vegetation Success: Combined areal cover of riparian and stream bank vegetation communities is at least 70%	Combined aerial cover of riparian and stream bank vegetation is 98.3%	YES
	Vegetation Success: Noxious weeds do not exceed 5% cover within the riparian buffer areas.	8.7% cover of noxious weeds observed within riparian exclosures	NO
	Woody Plants: Planted trees and shrubs must exhibit 50% survival after 5 years	Woody vegetation surveys indicate 32% survival during third growing season	NO
	Woody Plants: Planted trees and shrubs must exhibit 50% aerial coverage after 5 years	No data available	N/A
2. 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**	Bioengineered upper bank segment has eroded ≤ 1 foot annually¹ = Functioning	YES ¹
	Pritchard (1998) Proper Functioning Condition Rating = Functional	PFC rating is Functional - at risk with upward trend	NO
3. Willow Mats	Density of new willow stem growth achieves 50% aerial coverage after five years	Density of new willow growth along reconstructed bank segment is 1%	NO
4. Vegetation along river bank	Majority of plants on the river bank must have root stability indices of at least 6	Dominant vegetation along the majority of the stream bank is reed canary grass (<i>Phalaris arundinacea</i>), with a root stability index of 9.	YES
5. Weed Control	Montana State-listed noxious weeds do not exceed 5% cover within the bank restoration and riparian planting zones.	8.7% cover of noxious weeds observed within riparian exclosures	NO

1. Performance criteria does not account for bank instability beneath bioengineered treatment

* 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 force majeure event and restoration actions may not occur.

5.5. Weed Control

Control efforts were undertaken in 2014 and again in 2015 in an attempt to reduce infestations of noxious weeds found within the riparian exclosures. Control efforts in 2014 were not as effective as those conducted in 2015. While at least 50% of the weed infestations treated with herbicide throughout the site in 2015 were successfully eradicated, total cover of noxious weeds increased due to the difference in reporting methods used in 2015. Many infestations remain within the riparian exclosures, and additional control efforts will be necessary to achieve the 5% cover performance standard.

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 re-sloped bank while planted vegetation established. The coir fabric has been 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 within 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. Herbicide Treatments

Monitoring of the planted woody vegetation within the fenced exclosures indicated a substantial drop in survival between 2014 and 2015. Vole herbivory is likely a leading cause for mortality; however, some of the plants may have been exposed to herbicide treatments in 2015. Monitoring crews noted a much more aggressive application of herbicides in 2015 as compared to 2014, which may have resulted in additional mortality of planted shrubs.

6.3. Woody Plantings

Woody planting survival rates have dropped to levels that do not meet success criteria three years following installation. As a result, additional plantings will be necessary to achieve the target for woody vegetation establishment. The planting plan should incorporate techniques that 1) reduce mortality from herbivory, or 2) incorporates an expected mortality rate that will result in achieving the percent cover criterion for woody vegetation within the riparian exclosures. For example, if monitoring data indicate a mortality rate of 75% over five years, but the surviving plants provide 25% areal cover of woody vegetation, planting rates should be doubled to achieve the intended 50% cover by woody vegetation.

6.4. Woody vegetation along reconstructed bank

Willows installed along the reconstructed bank did not survive due to their being inundated throughout the growing season. Achieving the success criteria established for willow cover along the reconstructed bank will require installing additional willows. Willow cuttings can assist in achieving this performance criteria; although it may be achieved in a shorter timeframe if mature willow transplants were installed along the river bank. This technique would provide a greater percent cover of the bank by willows in a shorter period of time.

6.5. Fencing

Fencing inspections noted several locations where the fencing installed around the riparian exclosures had torn or slid down the supporting t-posts. All fencing issues were photo-documented and provided to MDT. A summary

7.0 LITERATURE CITED

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Appendix A

Project Area Maps

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



Flathead River



Legend

- Photo Points
- Transect Endpoints
- Fencing Issue
- Riparian Transects
- Exclosures

0 100 200 300 400 500
Feet

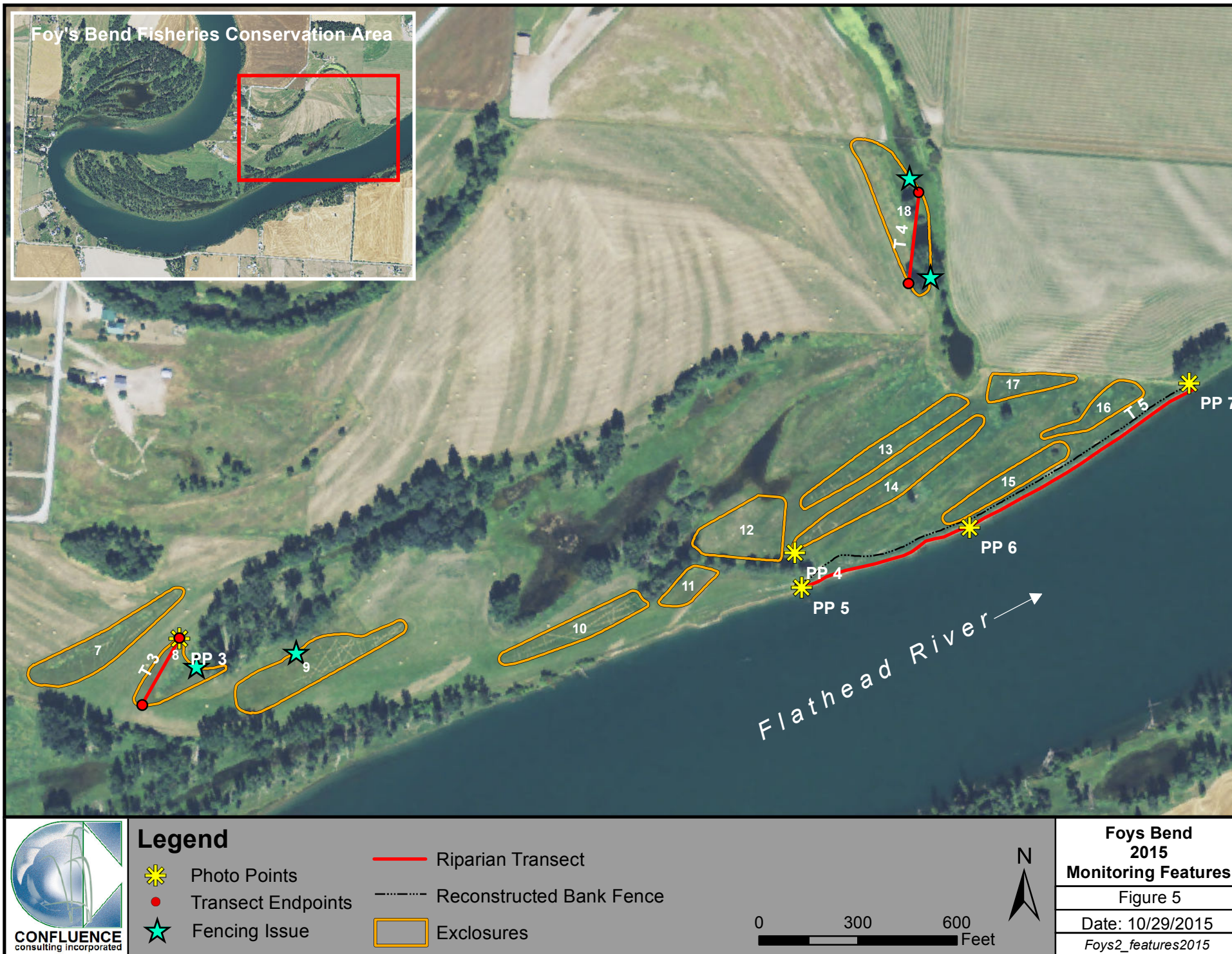


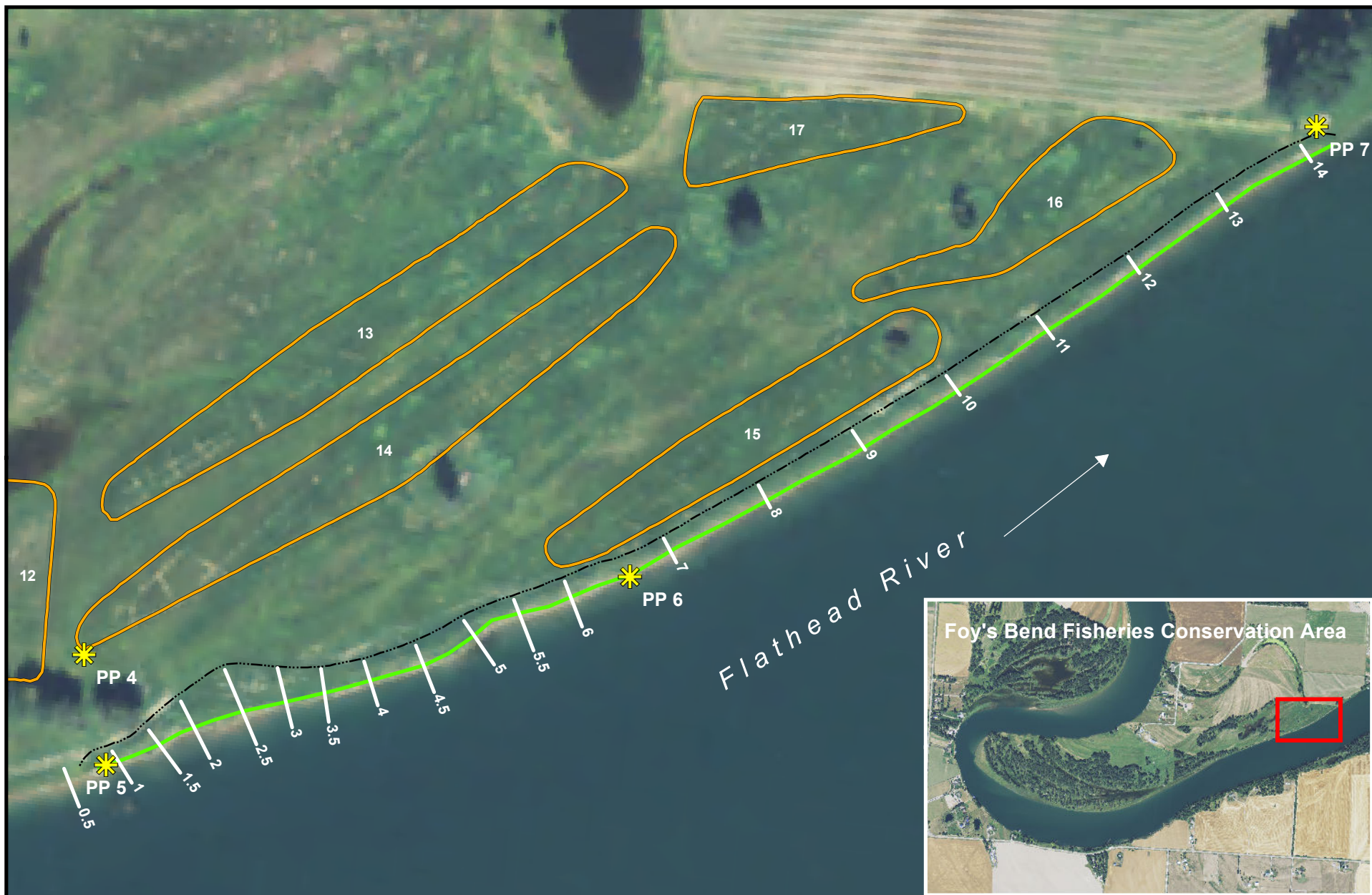
**Foy's Bend
2015
Monitoring Features**

Figure 4

Date: 10/29/2015

Foys1_features2015





Legend

Photo Points

Exclosures

Vegetation Transect #5 along reconstructed bank

Perpendicular Bank Profiles

Reconstructed Bank Fenceline

0 100 200 300 Feet

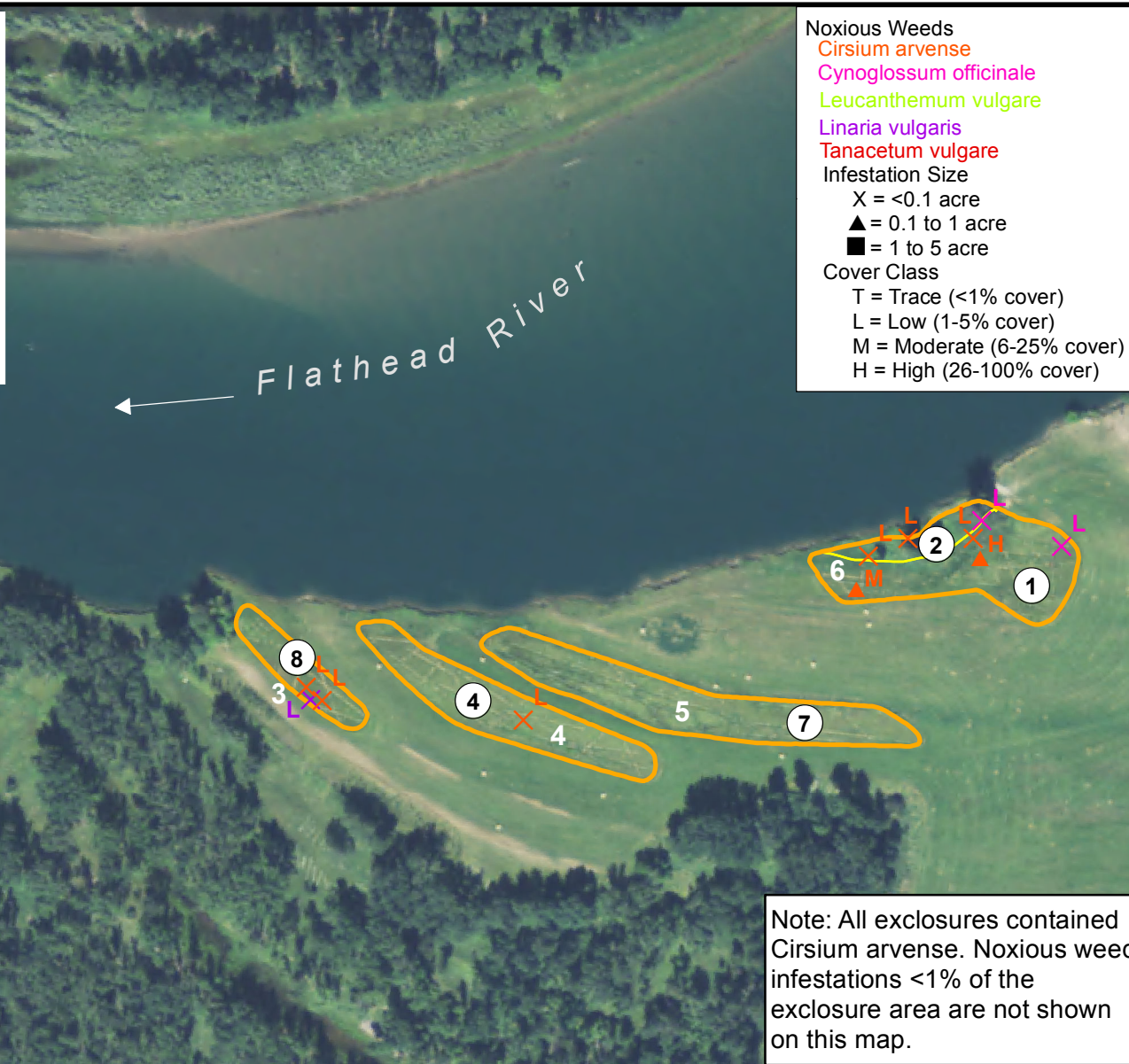


**Foy's Bend
2015
Monitoring Features**

Figure 6

Date: 10/29/2015

Foys3_features2015



Legend

- Planted Exclosure
- Vegetation Community Boundary



0 100 200 300 400 500
Feet

- 1 Phalaris/Poa Community
- 2 Populus Community
- 4 Alopecurus/Poa Community
- 5 Bromus/Symphoricarpos Community
- 6 Phalaris/Symphoricarpos Community

- 7 Poa/Dactylis Community
- 8 Bromus/Poa Community

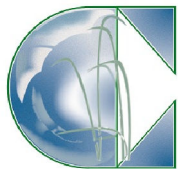
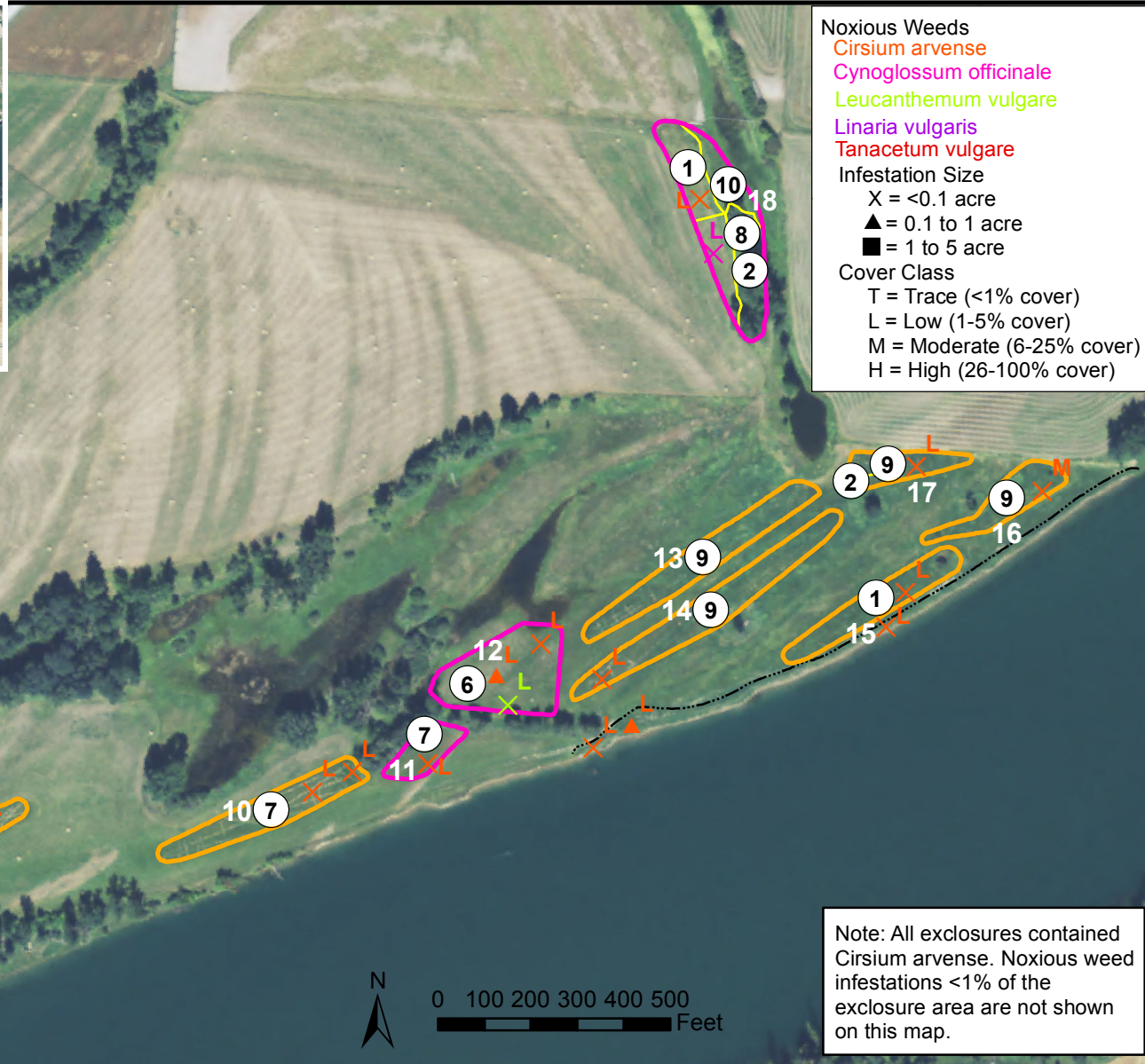
Foy's Bend- 2015 Noxious Weeds and Vegetation Communities

Figure 7

Date: 10/25/2015

Foys1_monitor2015.mxd

Foy's Bend Fisheries Conservation Area



Legend

- Planted Exclosure
- Unplanted Exclosure
- Vegetation Community Boundary
- Reconstructed Bank Fenceline

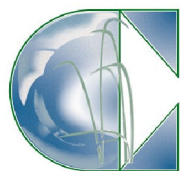
- | | |
|-------------------------------------|--------------------------------------|
| 1 Phalaris/Poa Community | 7 Poa/Dactylis Community |
| 2 Populus Community | 8 Bromus/Poa Community |
| 4 Alopecurus/Poa Community | 9 Phalaris Community |
| 5 Bromus/Symphoricarpos Community | 10 Schoenoplectus/Phalaris Community |
| 6 Phalaris/Symphoricarpos Community | |

Foy's Bend- 2015 Noxious Weeds and Vegetation Communities

Figure 8

Date: 10/25/2015

Foys2_monitor2015.mxd



CONFLUENCE

Legend

- Planted Exclosure
- Streambank Profiles
- Reconstructed Bank Fenceline



0 100 200 300 Feet

**Foy's Bend- 2015
Noxious Weeds
and Stream Bank
Transects**

Figure 9

Date: 10/26/2015

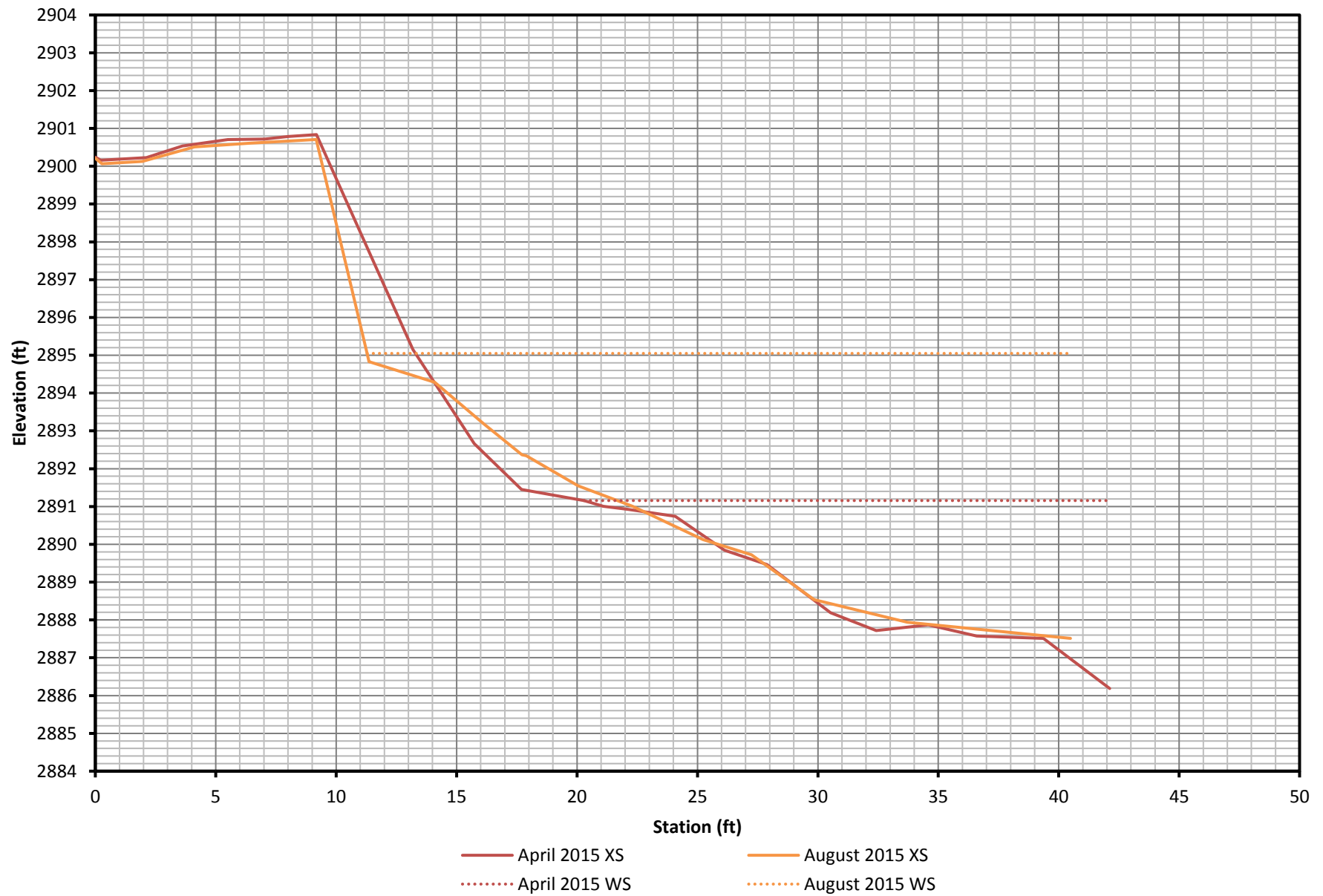
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Appendix B

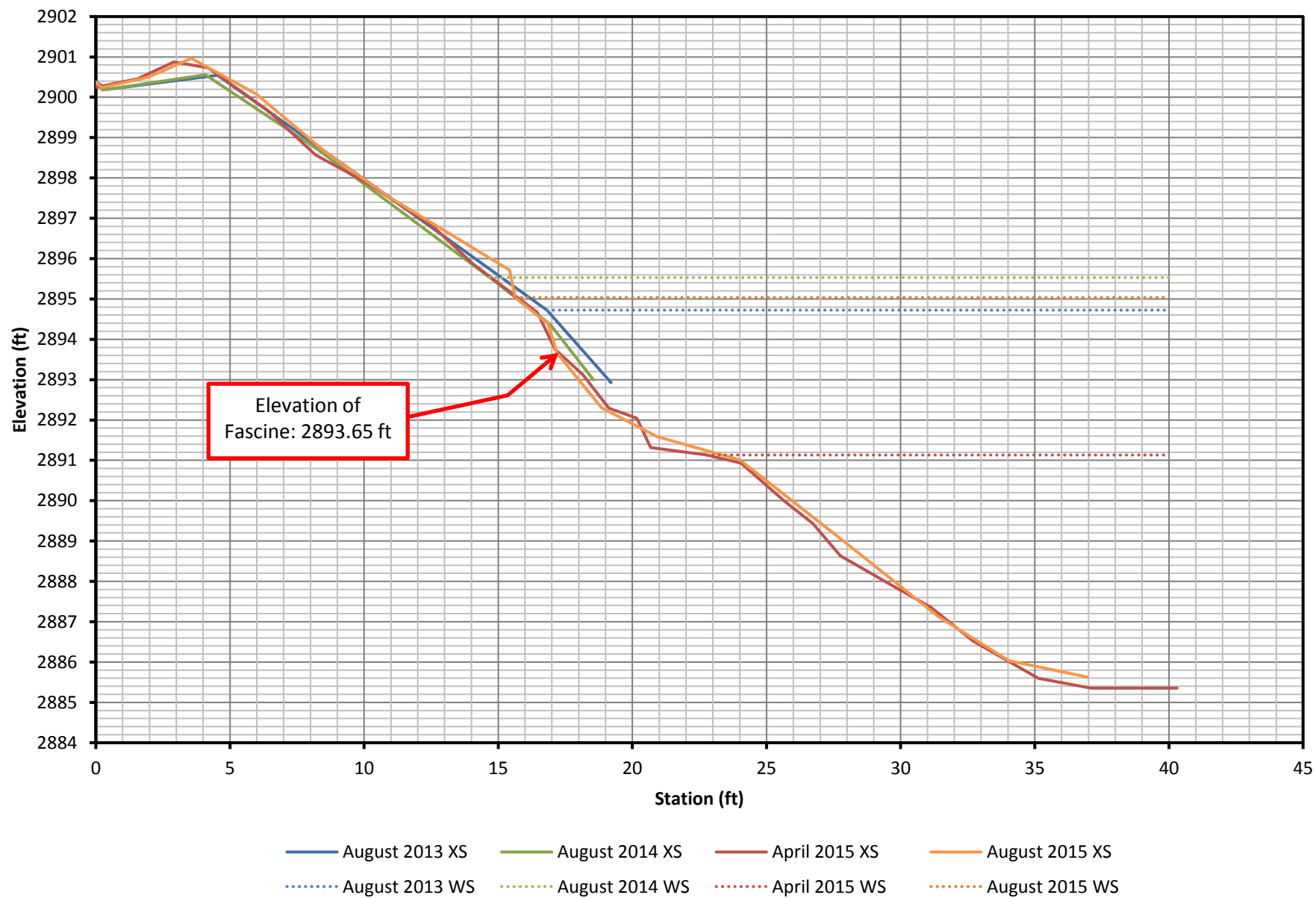
Reconstructed Bank Transect Plots

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

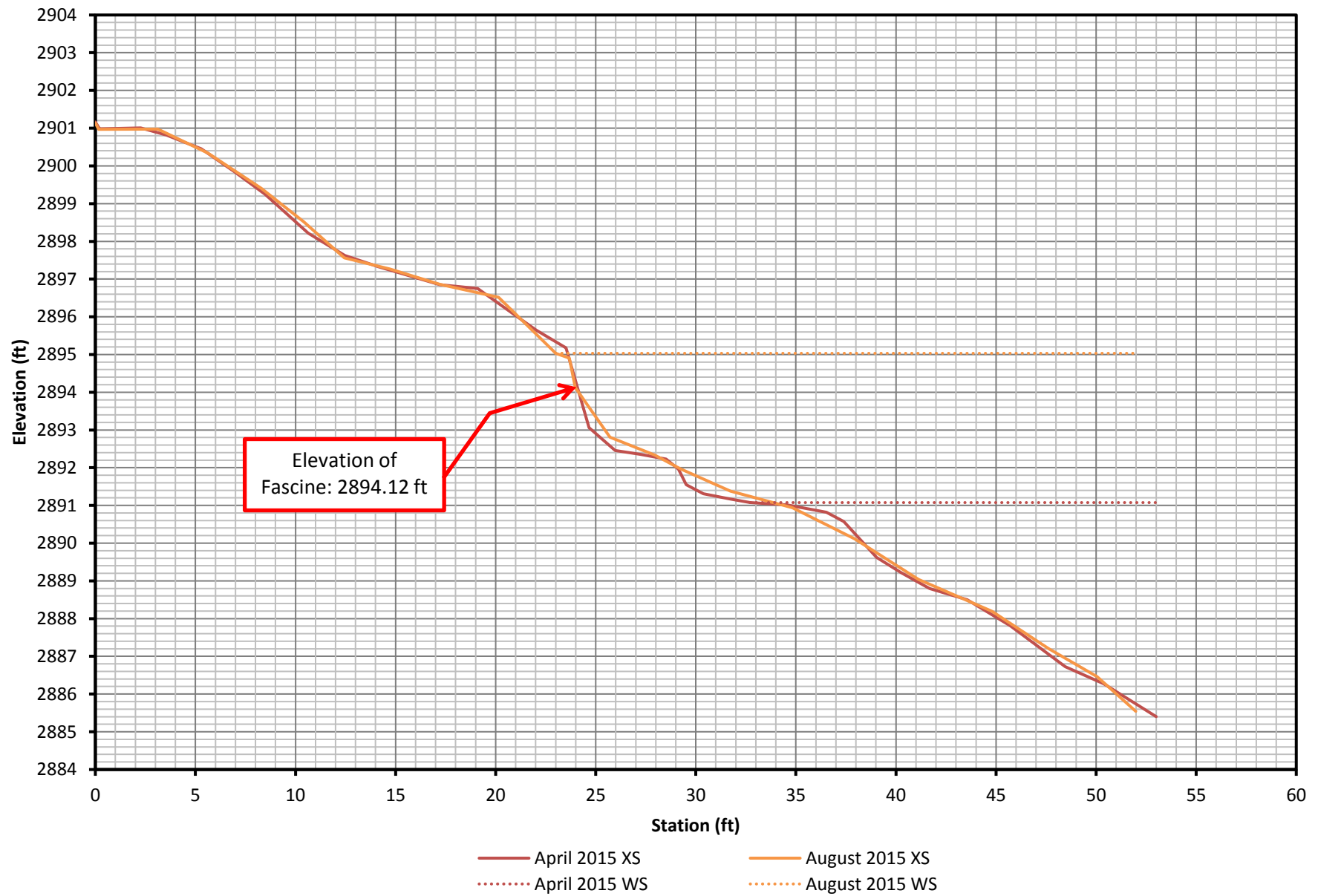
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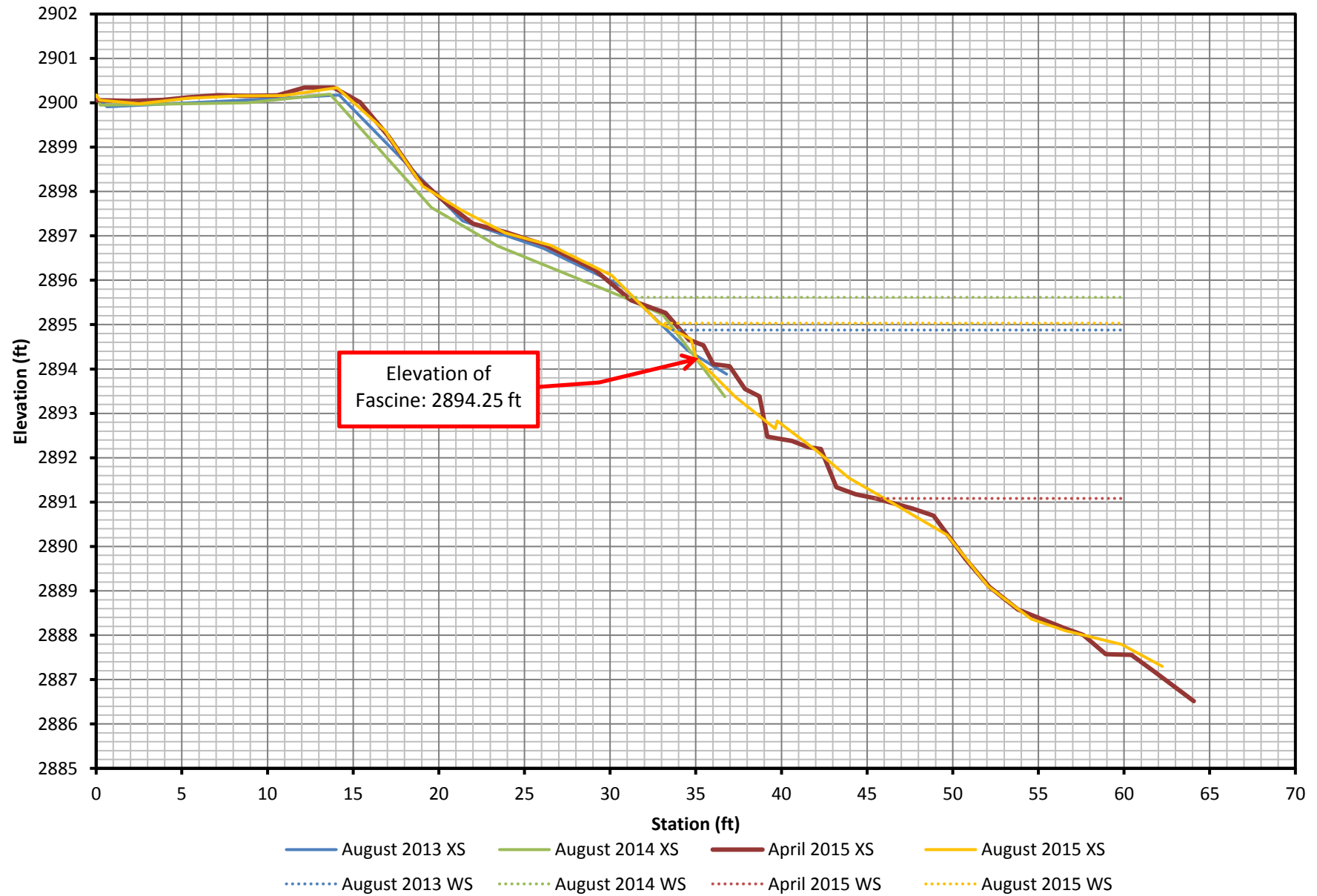
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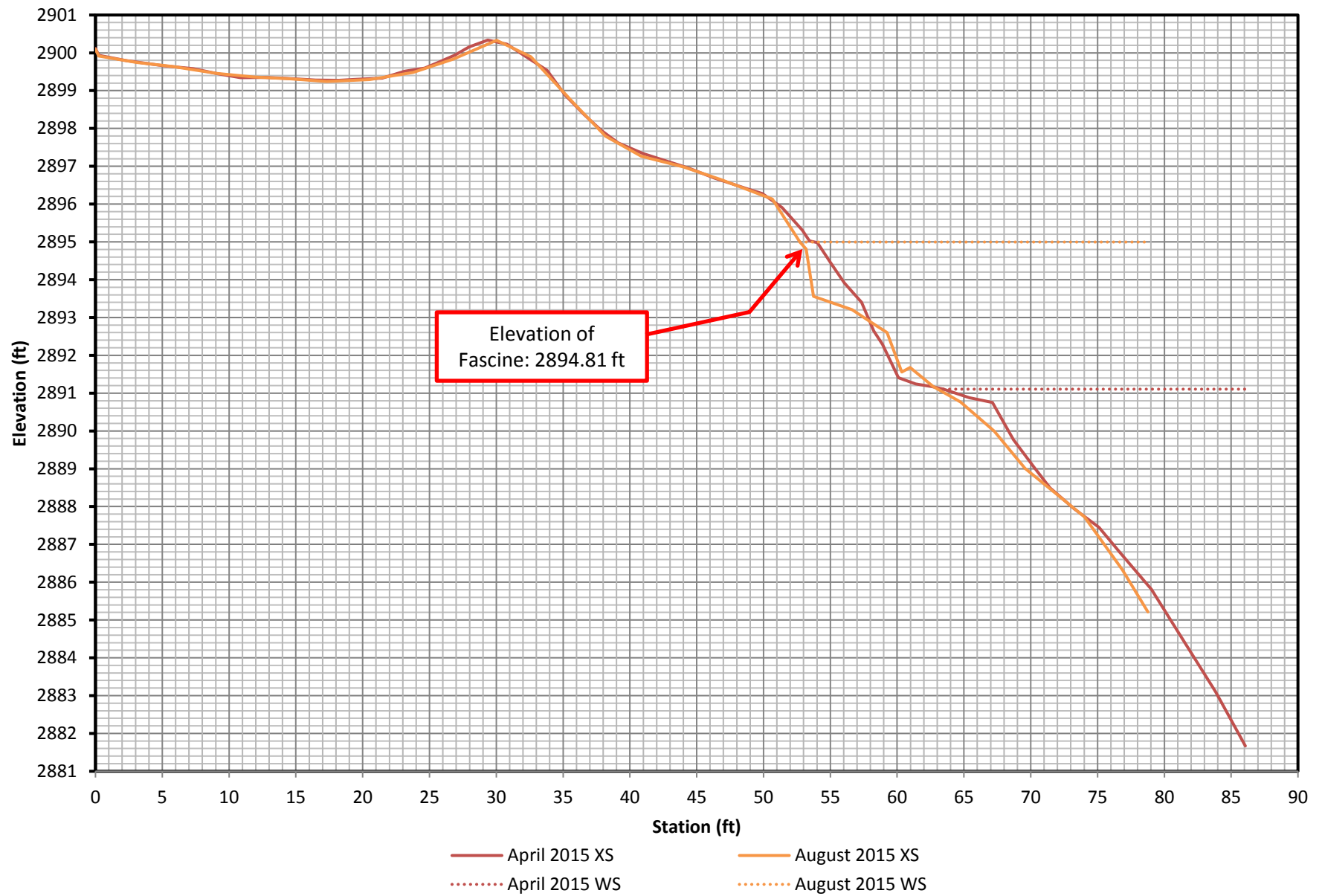
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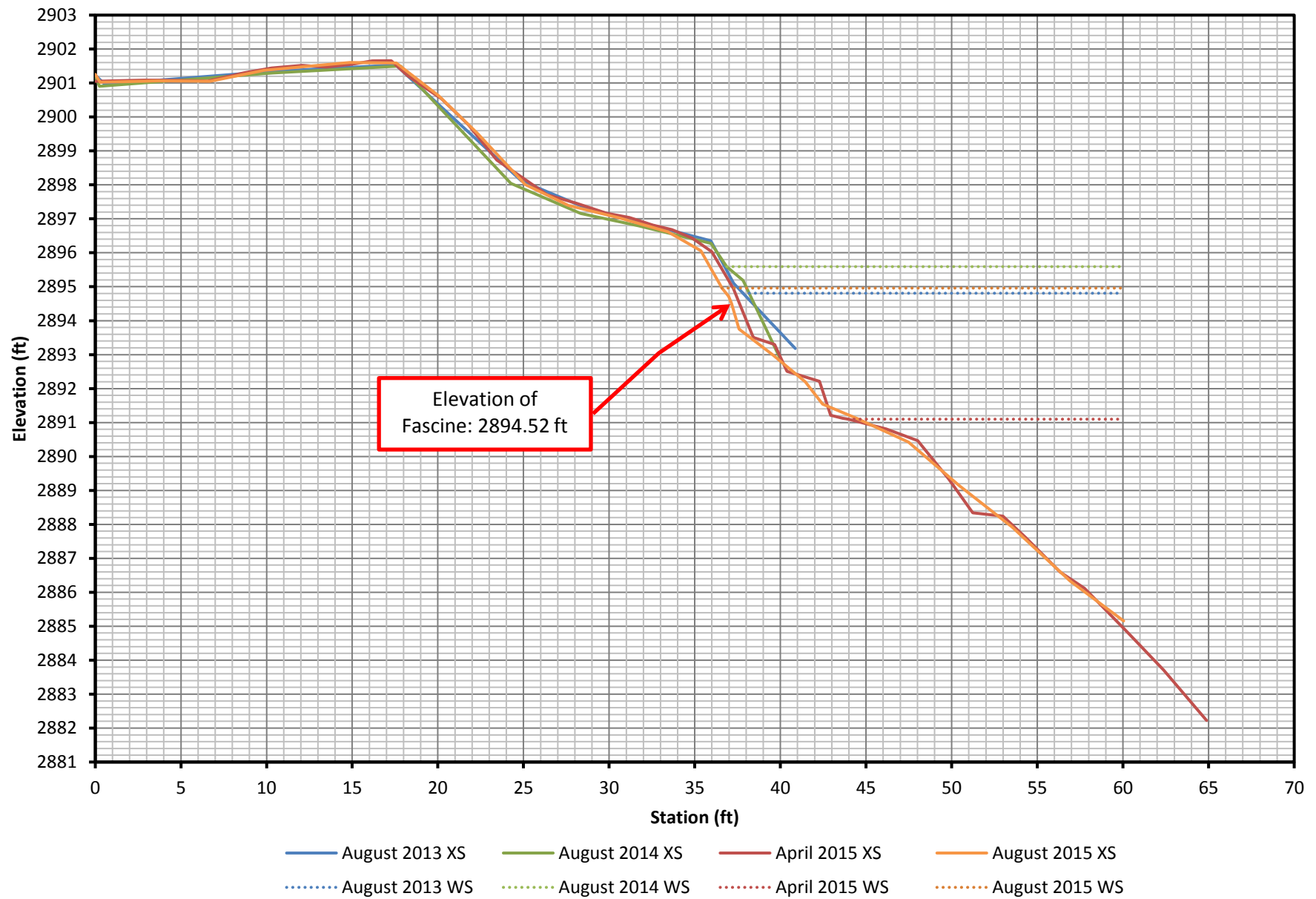
Foy's Bend Bank Transect #2



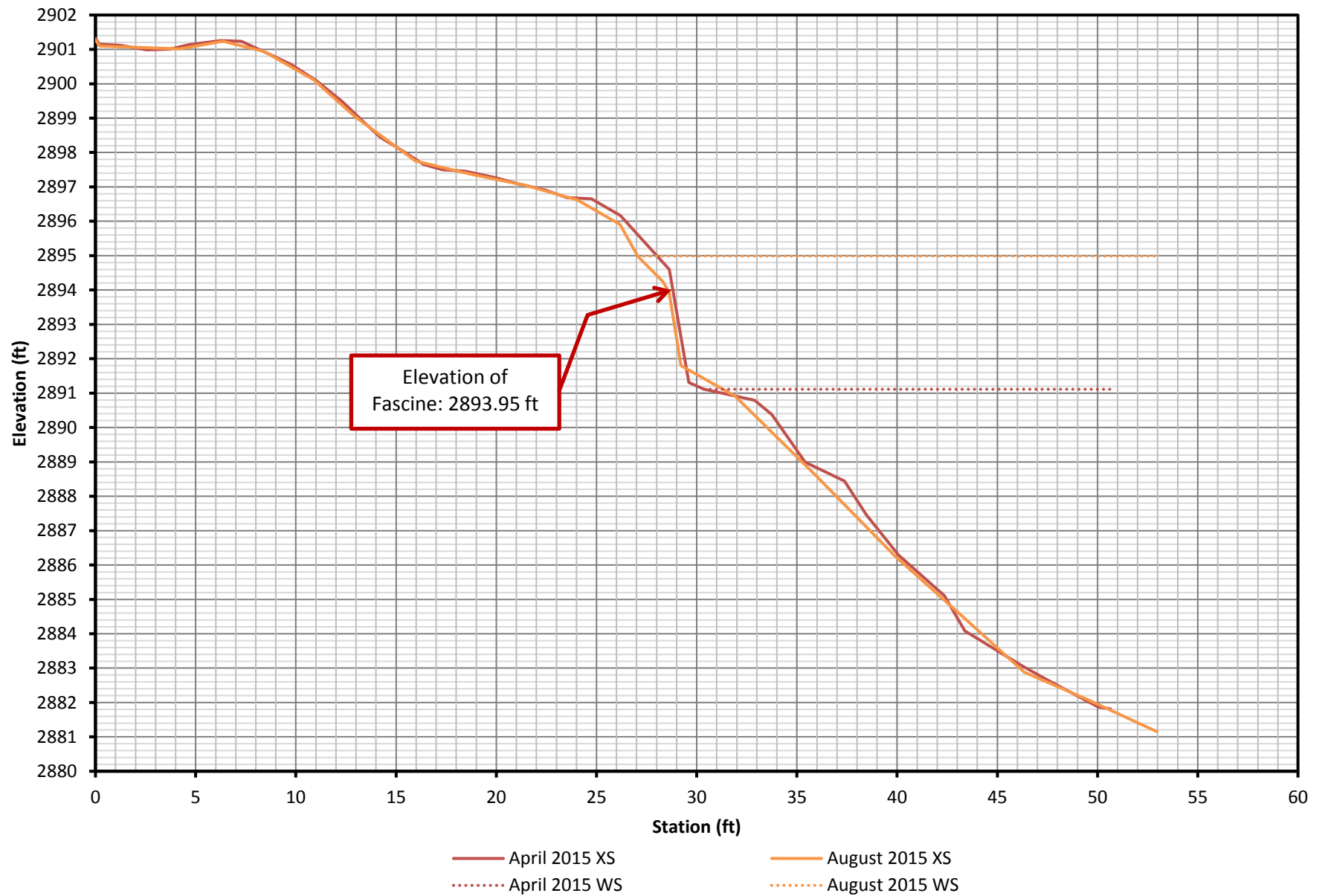
Foy's Bend Bank Transect #2.5



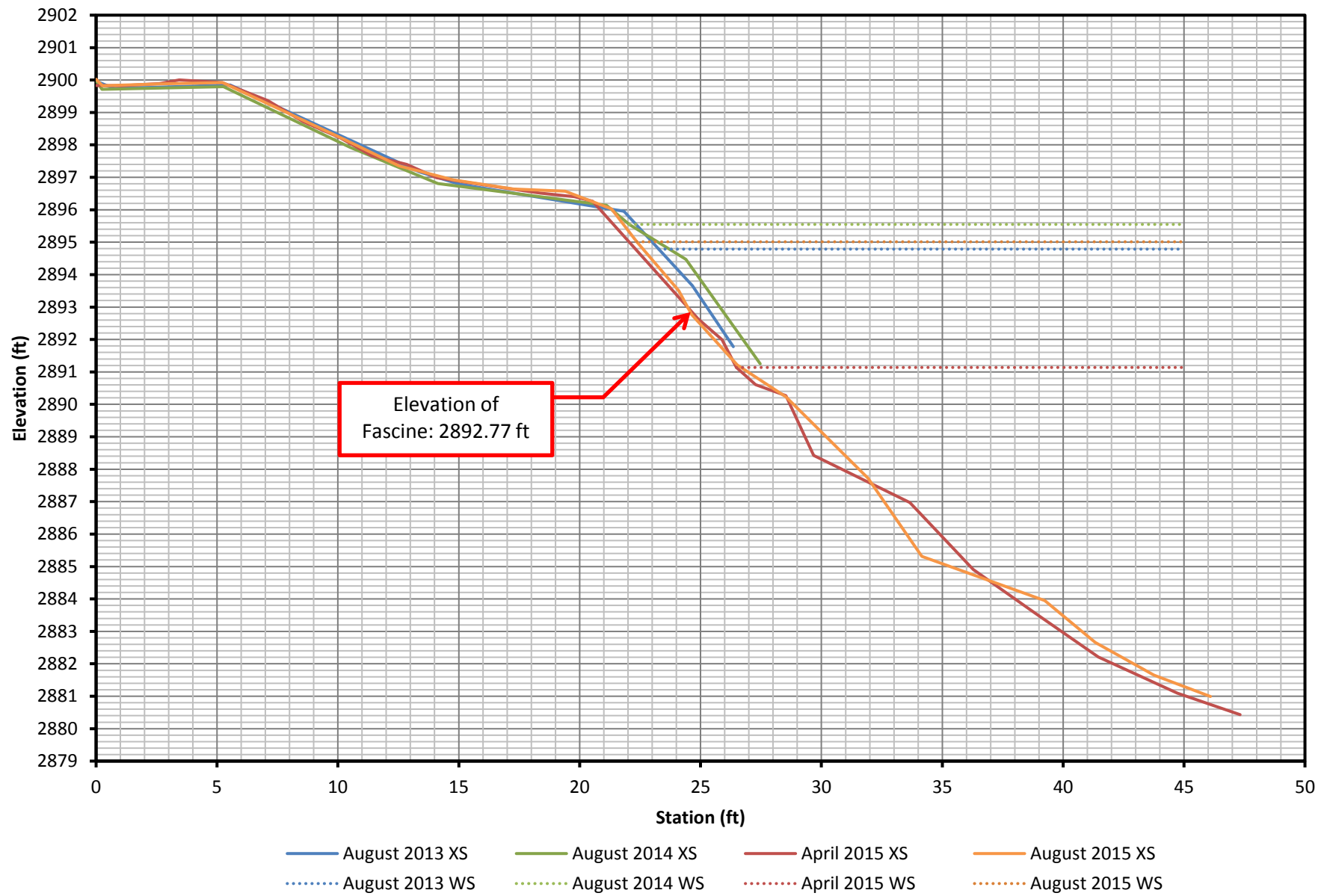
Foy's Bend Bank Transect #3



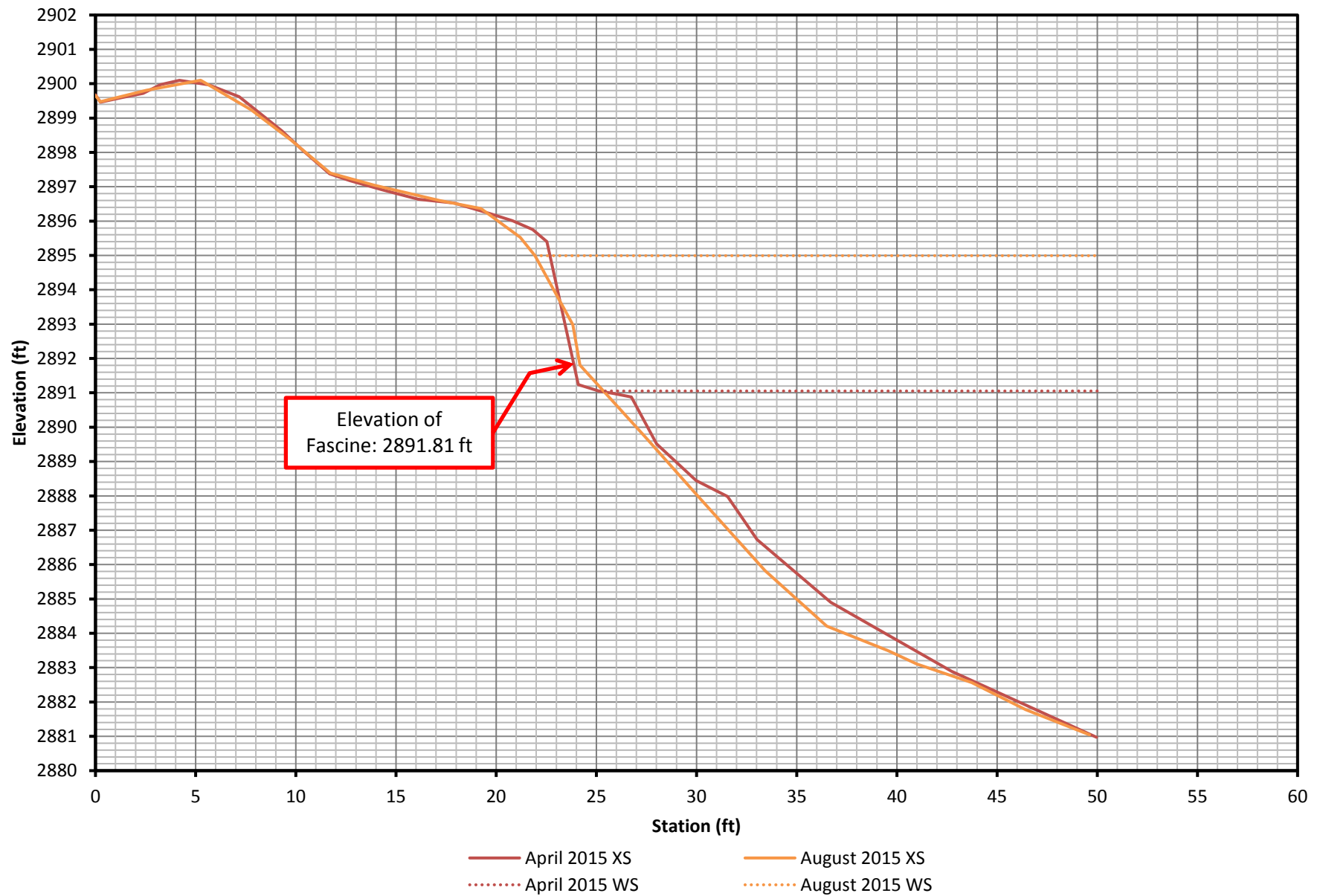
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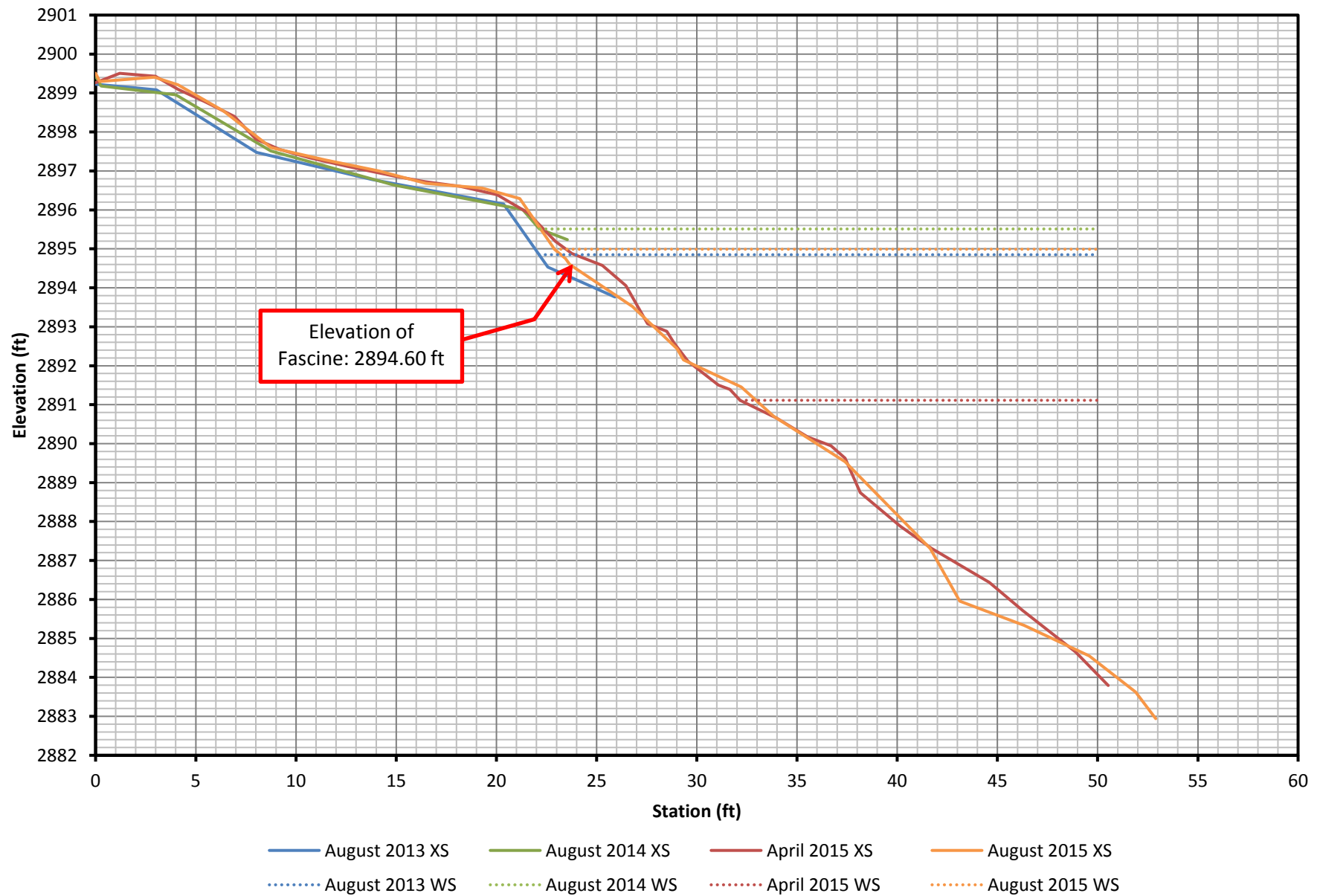
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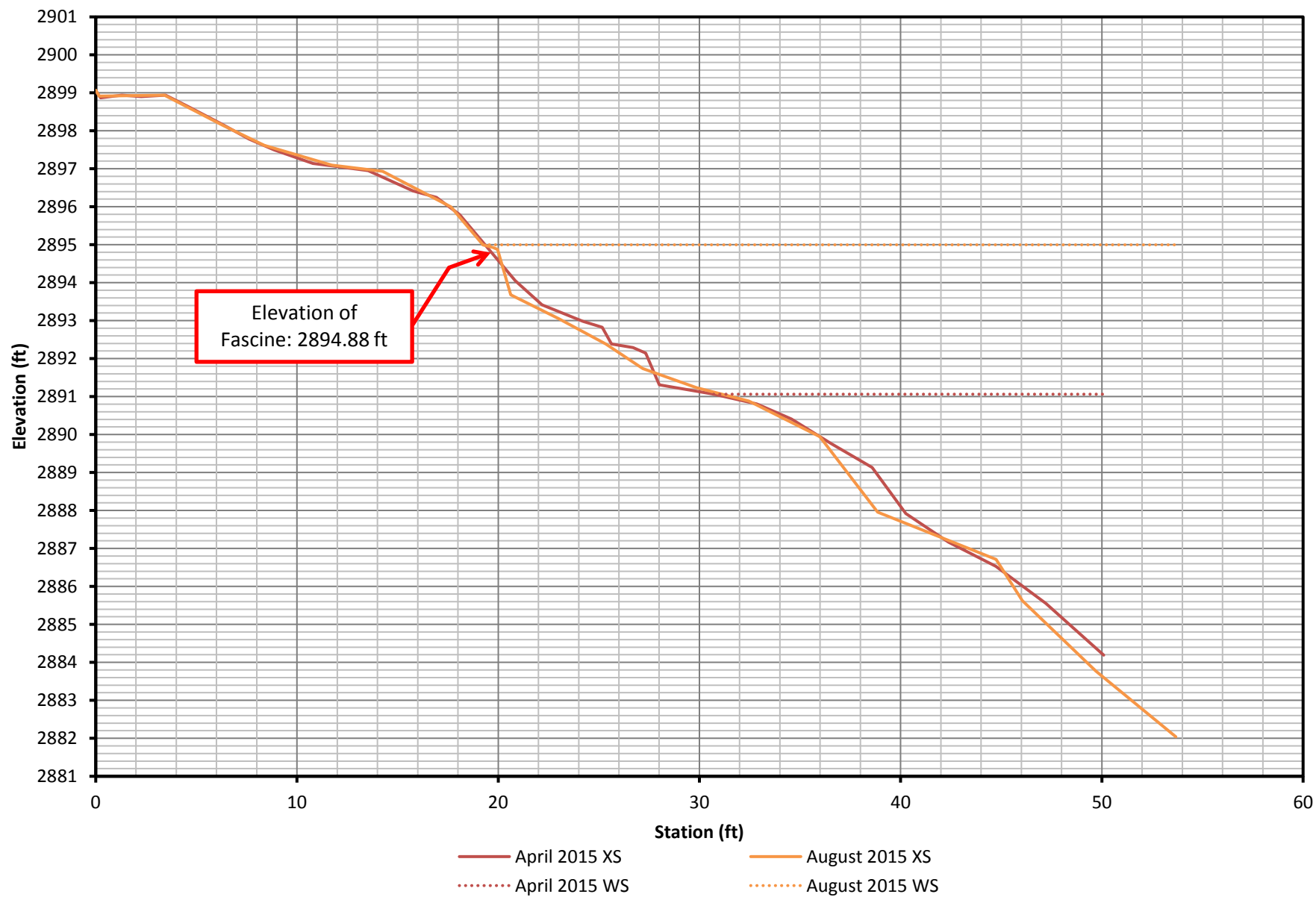
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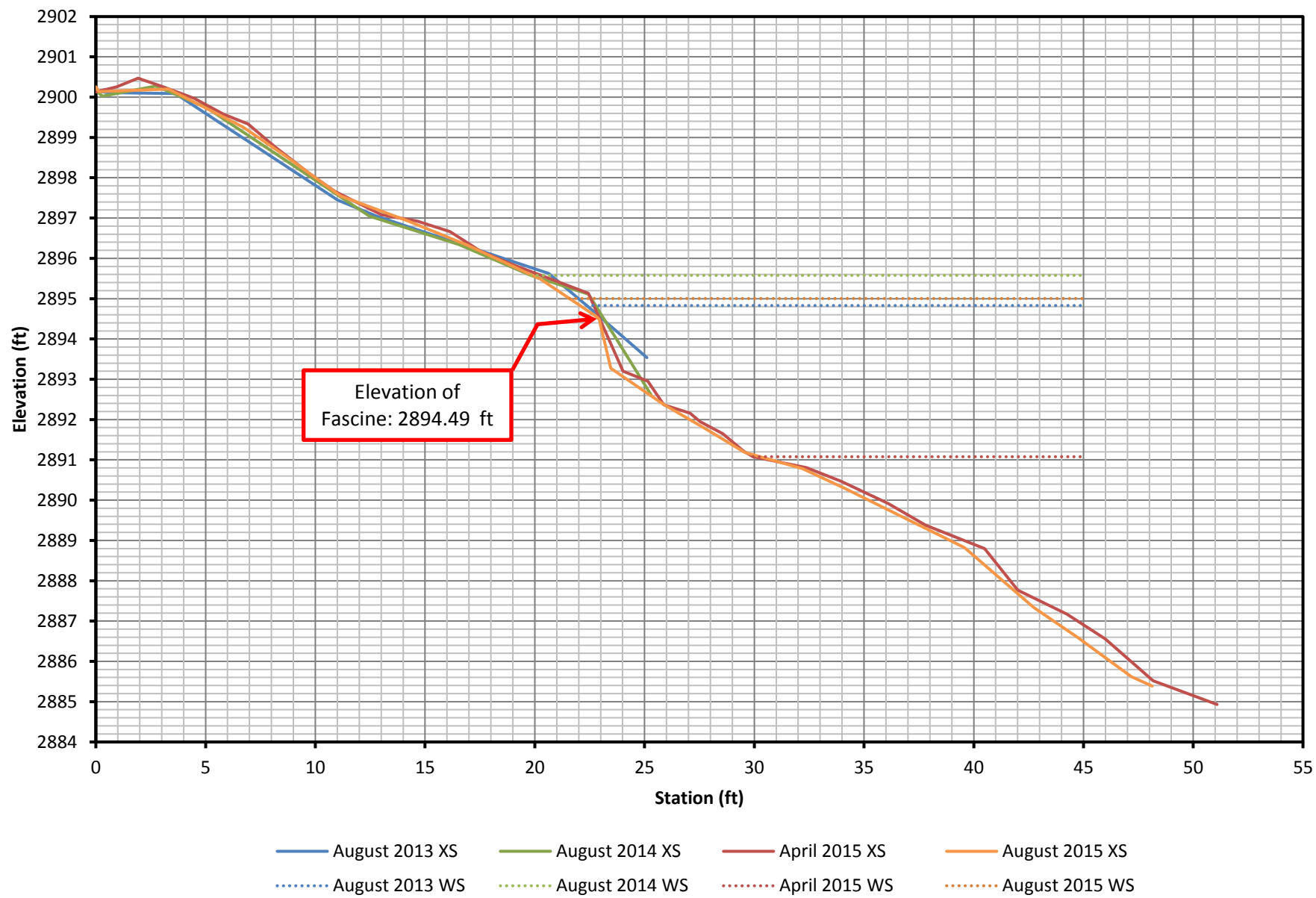
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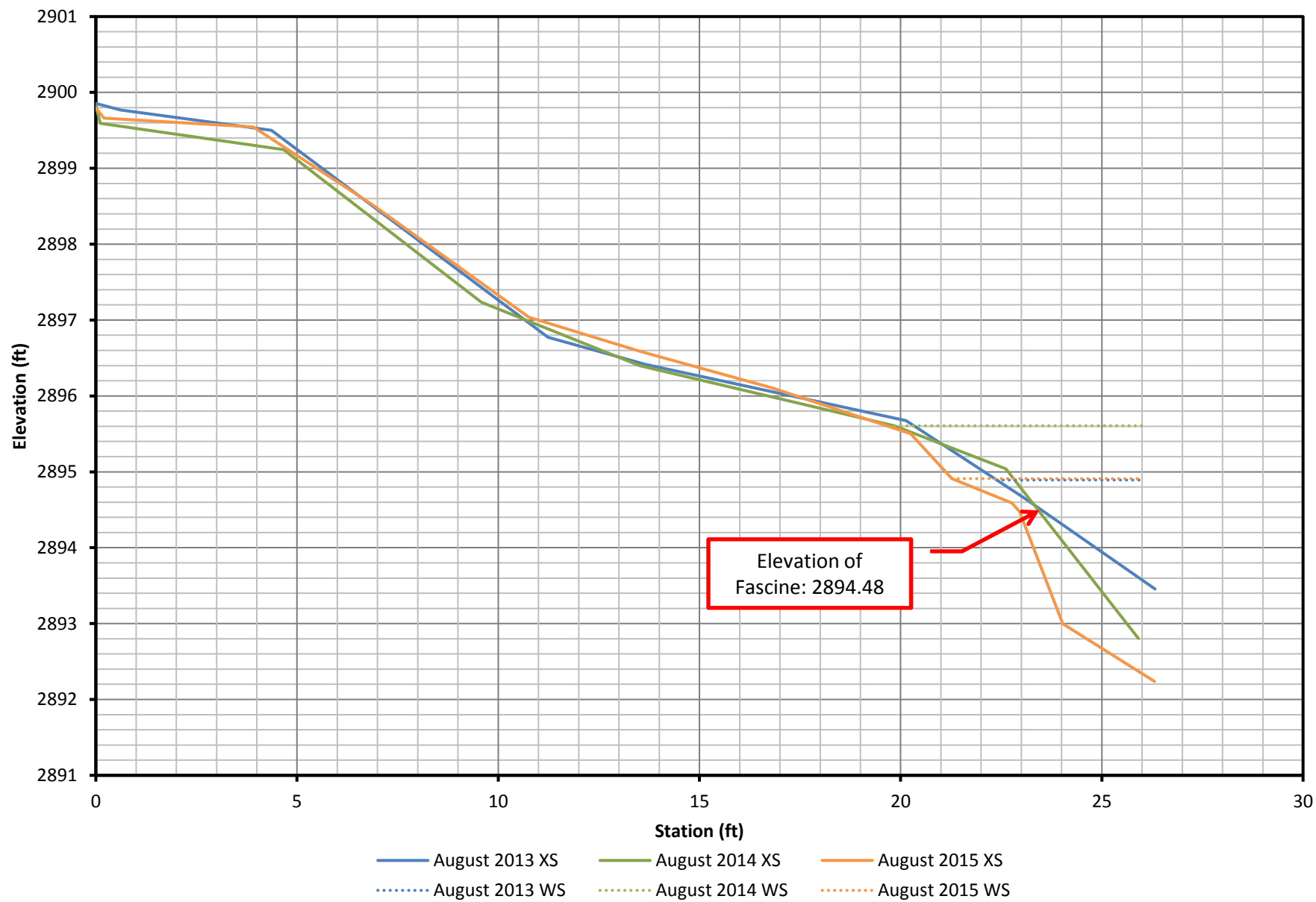
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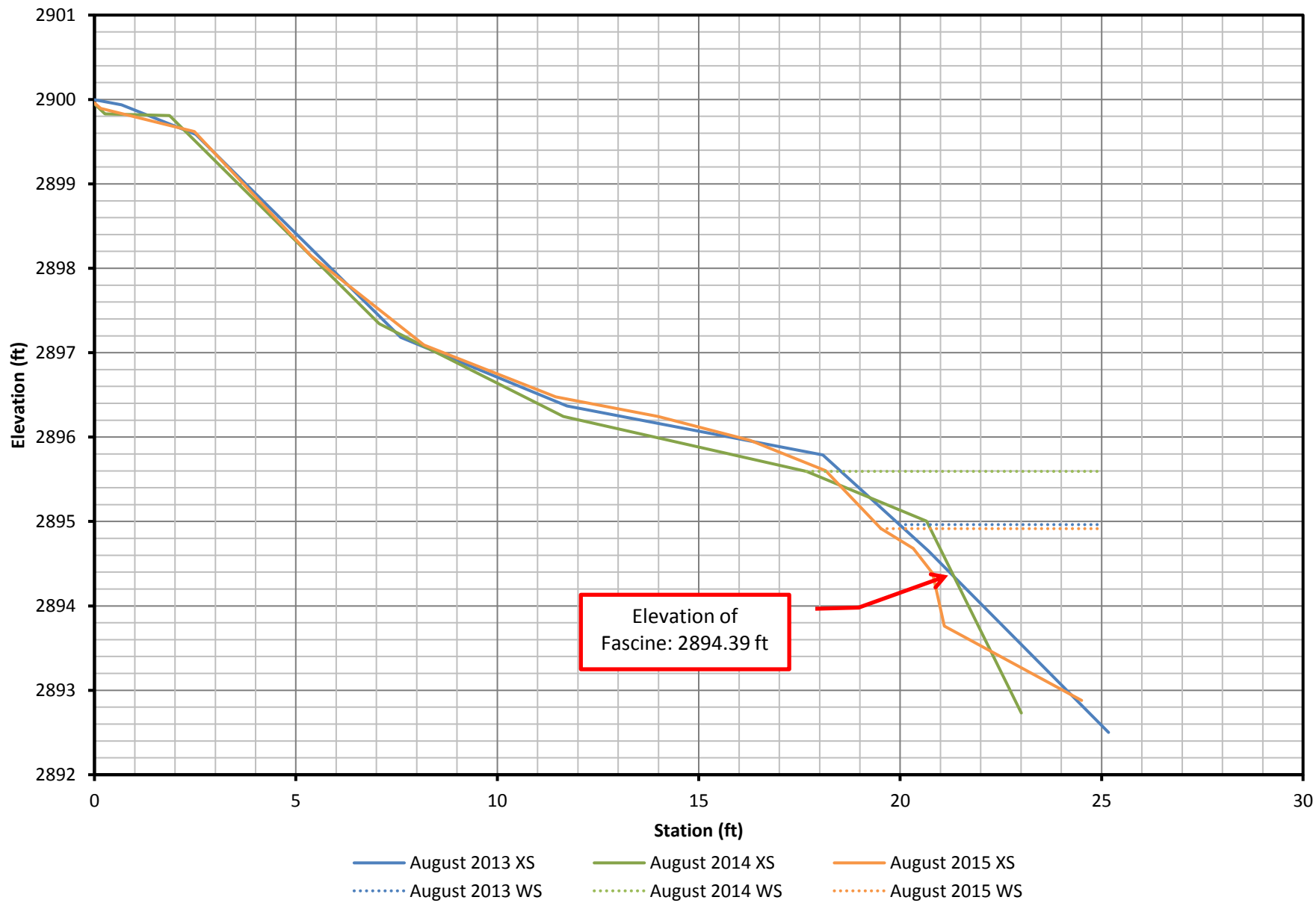
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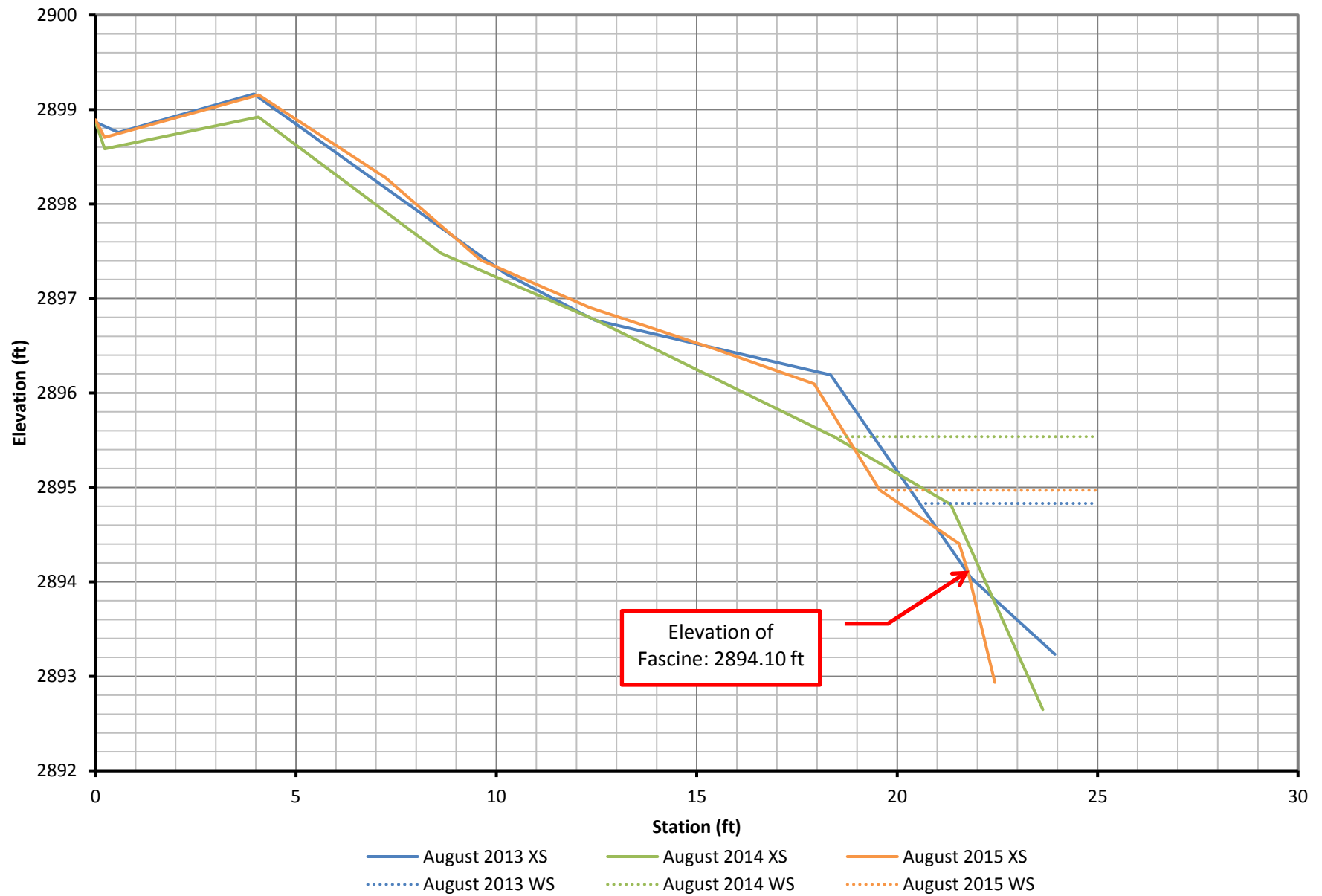
Foy's Bend Bank Transect #7



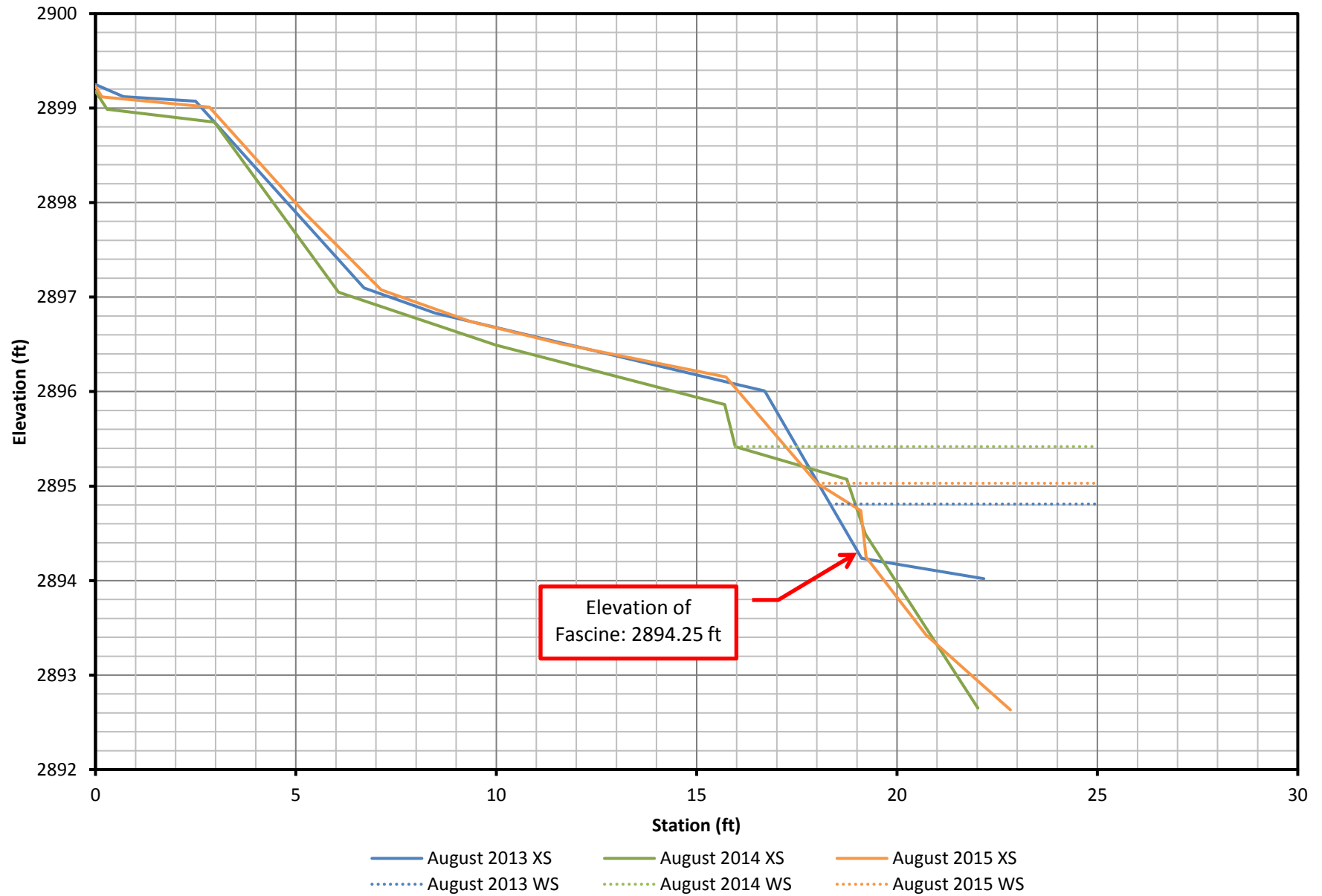
Foy's Bend Bank Transect #8



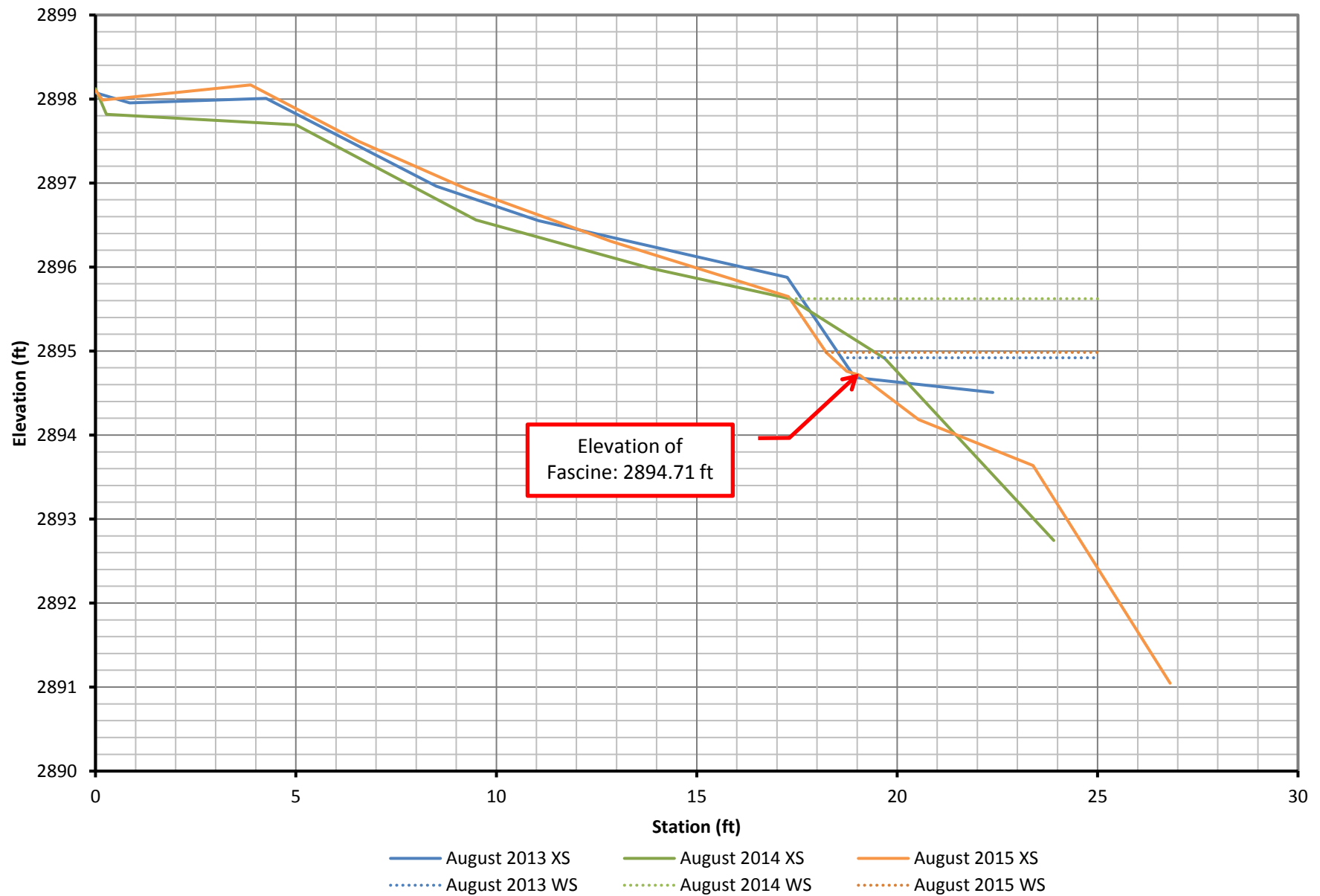
Foy's Bend Bank Transect #9



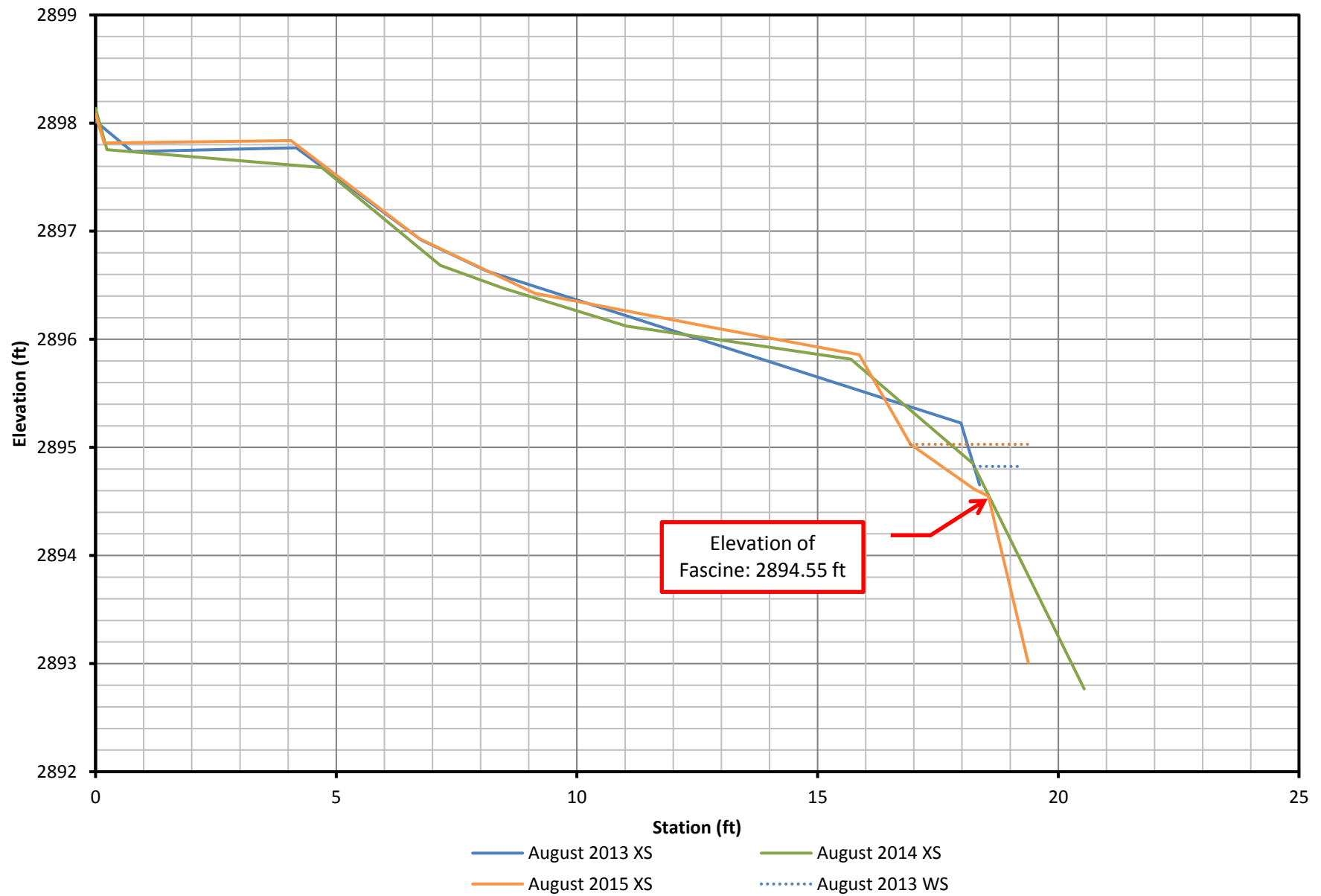
Foy's Bend Bank Transect #10



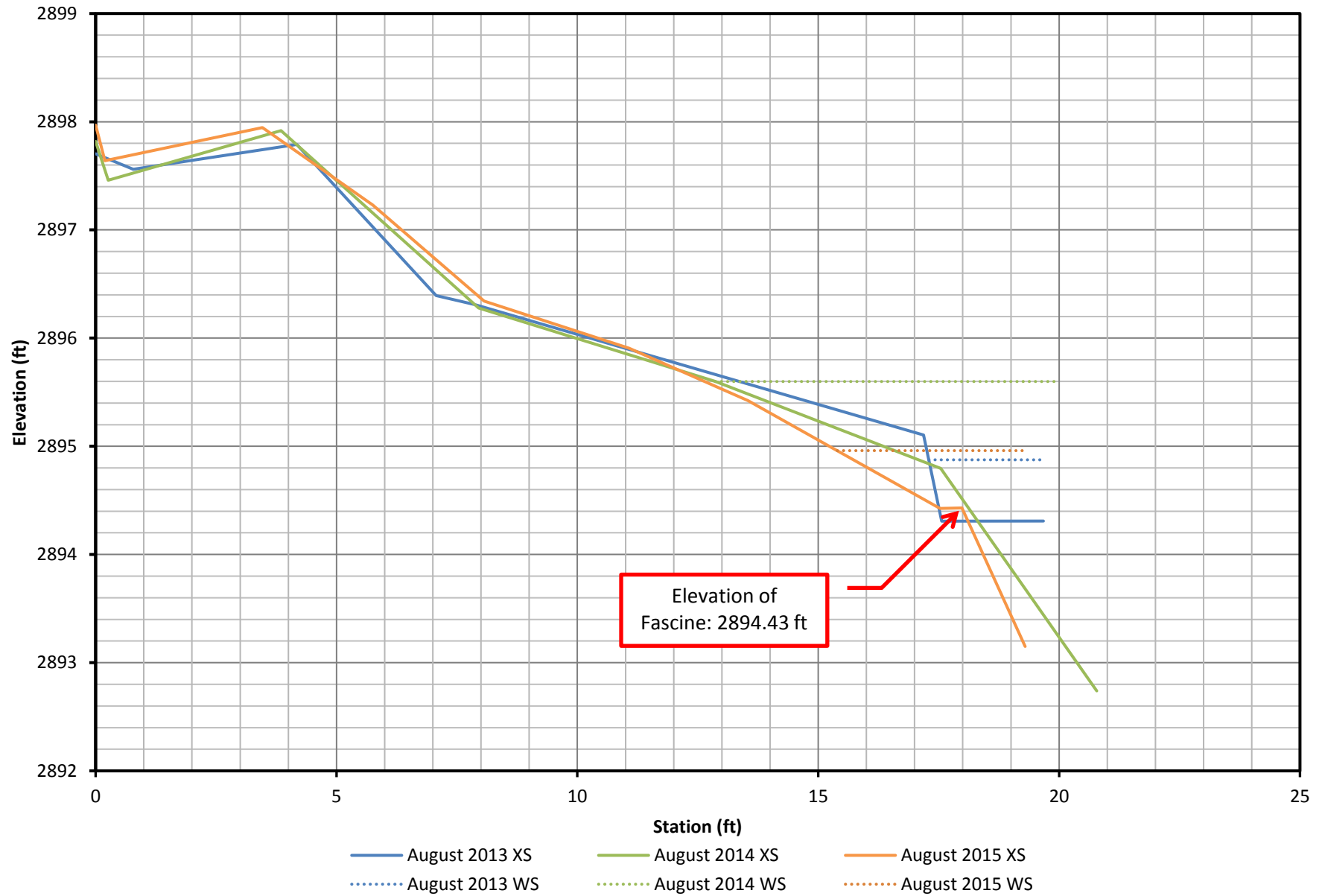
Foy's Bend Bank Transect #11



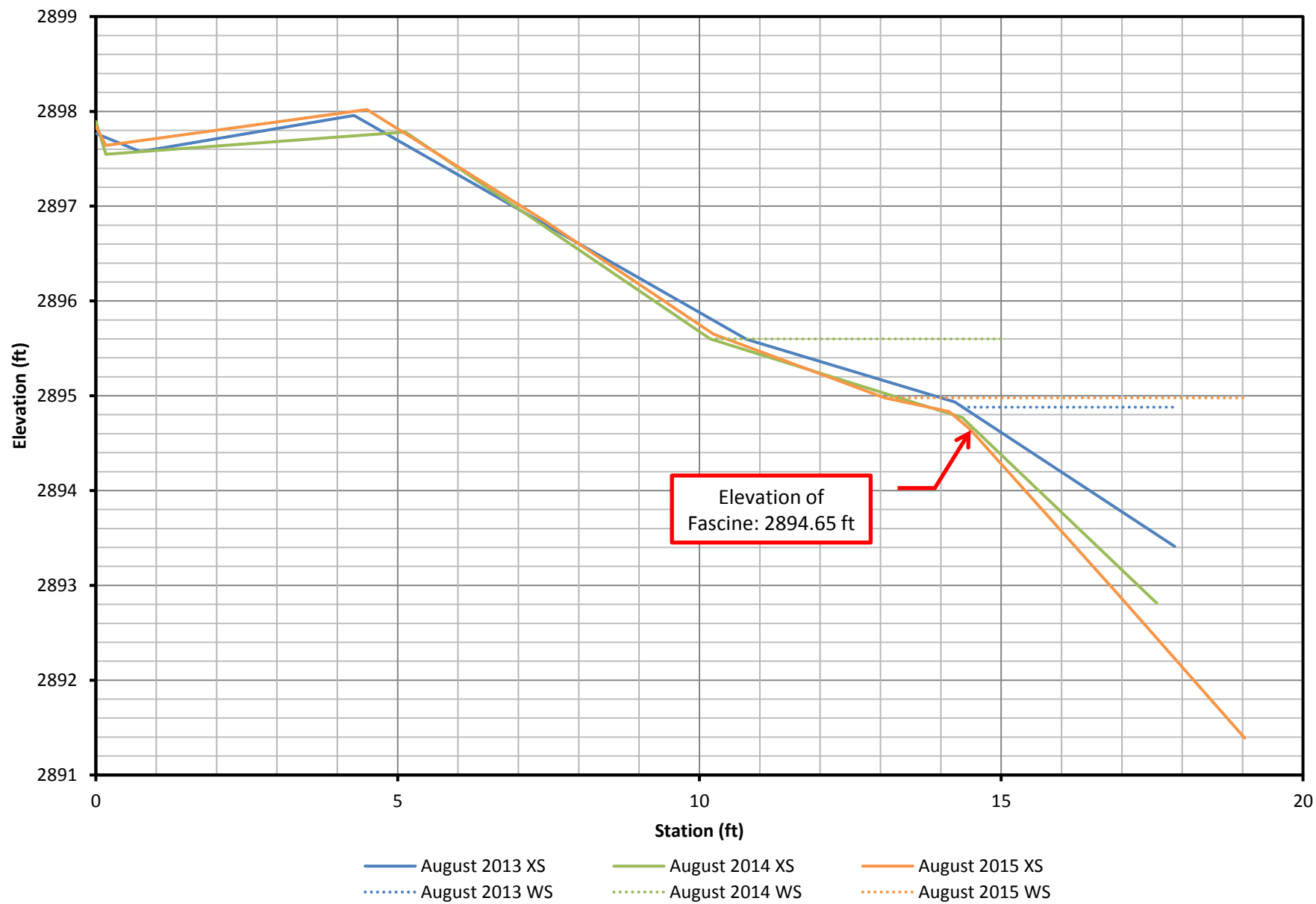
Foy's Bend Bank Transect #12



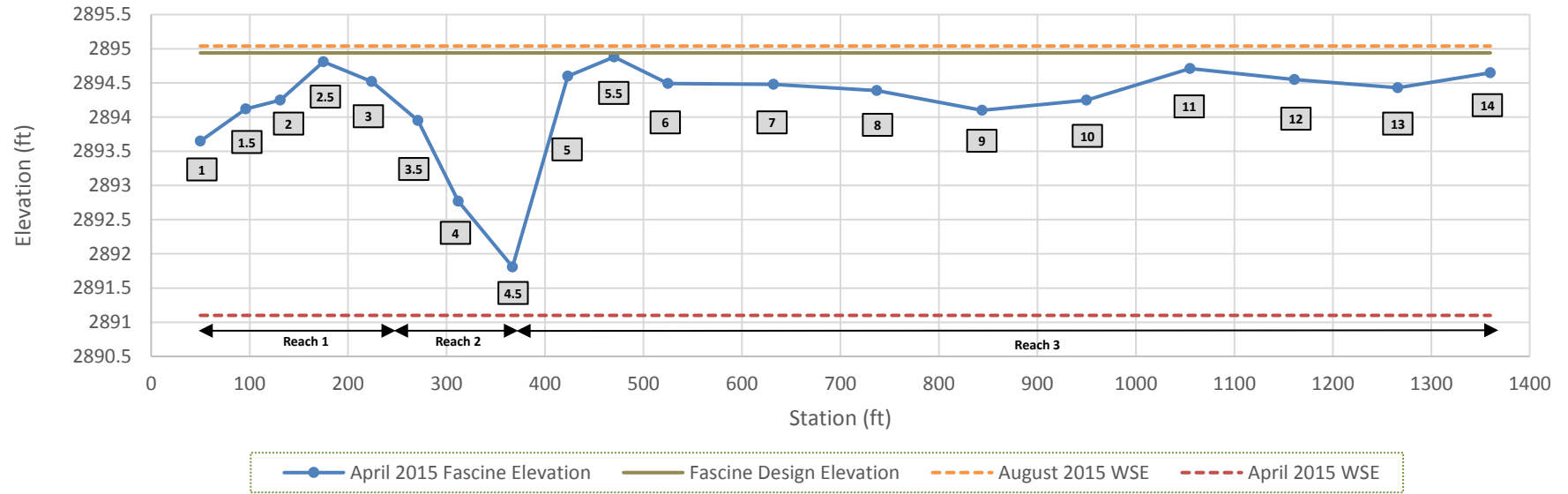
Foy's Bend Bank Transect #13



Foy's Bend Bank Transect #14



Foy's Bend Fascine Profile



Appendix C

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: 2013 and 2015 Monitoring Events



Photo Point 1—2013
Location: Exclosure 4
Compass: 315 (Northwest)



Photo Point 1—2015
Location: Exclosure 4
Compass: 315 (Northwest)



Photo Point 2—2013
Location: Exclosure 6
Compass: 90 (East)



Photo Point 2—2015
Location: Exclosure 6
Compass: 90 (East)



Photo Point 3.1—2013
Location: Exclosure 8
Compass: 135 (Southeast)



Photo Point 3.1—2015
Location: Exclosure 8
Compass: 135 (Southeast)

PHOTO INFORMATION

PROJECT NAME: Foy's Bend Stream Mitigation Site

DATE: 2013 and 2015 Monitoring Events



Photo Point 3.2—2013
Location: Exclosure 8
Compass: 158 (South-Southeast)



Photo Point 3.2—2015
Location: Exclosure 8
Compass: 158 (South-Southeast)



Photo Point 3.3—2013
Location: Exclosure 8
Compass: 203 (South-Southwest)



Photo Point 3.3—2015
Location: Exclosure 8
Compass: 203 (South-Southwest)



Photo Point 4—2013
Location: Exclosure 14
Compass: 90 (East)



Photo Point 4—2015
Location: Exclosure 14
Compass: 90 (East)

PHOTO INFORMATION

PROJECT NAME: Foy's Bend Stream Mitigation Site

DATE: 2013 and 2015 Monitoring Events



Photo Point 5.1—2013

Location: Upstream extent of stabilized bank
Compass: 270 (West)



Photo Point 5.1—2015

Location: Upstream extent of stabilized bank
Compass: 270 (West)



Photo Point 5.2—2013

Location: Restored streambank looking downstream
Compass: 45 (Northeast)



Photo Point 5.2—2015

Location: Restored streambank looking downstream
Compass: 45 (Northeast)



Photo Point 6.1—2013

Location: Restored streambank upstream
Compass: 270 (West)



Photo Point 6.1—2015

Location: Restored streambank upstream
Compass: 270 (West)

PHOTO INFORMATION

PROJECT NAME: Foy's Bend Stream Mitigation Site

DATE: 2013 and 2015 Monitoring Events



Photo Point 6.2—2013

Location: Restored streambank looking downstream **Compass:** 45 (Northeast)



Photo Point 6.2—2015

Location: Restored streambank looking downstream **Compass:** 45 (Northeast)



Photo Point 7—2013

Location: Extent of restored streambank, looking upstream. **Compass:** 225 (Southwest)



Photo Point 7—2015

Location: Extent of restored streambank, looking upstream. **Compass:** 225 (Southwest)



Additional Photo 1 - 2015

Description: Sprayed weeds in Exclosure #6



Additional Photo 2 - 2015

Description: Sprayed weeds in Exclosure #6

PHOTO INFORMATION

PROJECT NAME: Foy's Bend Stream Mitigation Site

DATE: August, 2015 Site Visit



Additional Photo 3 - 2015

Description: Submerged woody fascine along reconstructed bank. Taken looking downstream near bank transect 6



Additional Photo 4 - 2015

Description: Leading edge of coir bank and submerged woody fascine. Taken looking upstream near bank transect 6



Additional Photo 5 - 2015

Description: Suspended fine sediment along reconstructed bank following passing motor boat. Taken looking upstream at bank transect 1



Additional Photo 6 - 2015

Description: Large wood deposited along reconstructed river bank. Taken looking downstream near bank transect 10

PHOTO INFORMATION

PROJECT NAME: Foy's Bend Stream Mitigation Site

DATE: March, 2015 Site Visit



Additional Photo 7– March, 2015

Description: Evidence of vole herbivory on planted shrubs within exclosures.



Additional Photo 8– March, 2015

Description: Upper extent of reconstructed bank at low water. Taken looking upstream near bank transect 1



Additional Photo 9 – March, 2015

Description: Upstream extent of undermined segment of reconstructed bank, looking downstream near bank transect 3



Additional Photo 10 – March, 2015

Description: Downstream extent of undermined segment of reconstructed bank, looking upstream near transect 4.5

PHOTO INFORMATION

PROJECT NAME: Foy's Bend Stream Mitigation Site

DATE: March, 2015 Site Visit



Additional Photo 11 - March 2015

Description: Downstream extent of reconstructed bank segment during low water; taken near bank transect 12



Additional Photo 12 - March 2015

Description: Downstream extent of reconstructed bank segment during low water; taken near bank transect 13



Additional Photo 13 - March 2015

Description: Phalaris sod mats beneath fascine; taken looking upstream near transect 10



Additional Photo 14 - March 2015

Description: Remnant stumps along lower reconstructed bank segment; taken near transect 10



PHOTOGRAPHIC INSPECTION INFORMATION

Page 1 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 0.5: Looking South



T 0.5: Looking North



PHOTOGRAPHIC INSPECTION INFORMATION

Page 2 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 0.5: Looking West up stream



T 0.5: Looking East down stream



PHOTOGRAPHIC INSPECTION INFORMATION

Page 3 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 1.0 : Looking South



T 1.0 : Looking North



PHOTOGRAPHIC INSPECTION INFORMATION

Page 4 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 1.0: Looking West up stream



T 1.0: Looking East down stream



PHOTOGRAPHIC INSPECTION INFORMATION

Page 5 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 1.5 : Looking South



T 1.5 : Looking North



PHOTOGRAPHIC INSPECTION INFORMATION

Page 6 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 1.5: Looking West up stream



T 1.5: Looking East down stream



PHOTOGRAPHIC INSPECTION INFORMATION

Page 7 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 2.0 : Looking South



T 2.0 : Looking North



PHOTOGRAPHIC INSPECTION INFORMATION

Page 8 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 2.0 : Looking West up stream



T 2.0 : Looking East down stream



PHOTOGRAPHIC INSPECTION INFORMATION

Page 9 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 2.5 : Looking South



T 2.5 : Looking North



PHOTOGRAPHIC INSPECTION INFORMATION

Page 10 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 2.5 : Looking West up stream



T 2.5 : Looking East down stream



PHOTOGRAPHIC INSPECTION INFORMATION

Page 11 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 3.0 : Looking South



T 3.0 : Looking North



PHOTOGRAPHIC INSPECTION INFORMATION

Page 12 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 3.0 : Looking West up stream



T 3.0 : Looking East down stream



PHOTOGRAPHIC INSPECTION INFORMATION

Page 13 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 3.5 : Looking South



T 3.5 : Looking North



PHOTOGRAPHIC INSPECTION INFORMATION

Page 14 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 3.5 : Looking West up stream



T 3.5 : Looking East down stream



PHOTOGRAPHIC INSPECTION INFORMATION

Page 15 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 4.0 : Looking South



T 4.0 : Looking North



PHOTOGRAPHIC INSPECTION INFORMATION

Page 16 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 4.0 : Looking West up stream



T 4.0 : Looking East down stream



PHOTOGRAPHIC INSPECTION INFORMATION

Page 17 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 4.5 : Looking South



T 4.5 : Looking North



PHOTOGRAPHIC INSPECTION INFORMATION

Page 18 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 4.5 : Looking West up stream



T 4.5 : Looking East down stream



PHOTOGRAPHIC INSPECTION INFORMATION

Page 19 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 5.0 : Looking South



T 5.0 : Looking North



PHOTOGRAPHIC INSPECTION INFORMATION

Page 20 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 5.0 : Looking West up stream



T 5.0 : Looking East down stream



PHOTOGRAPHIC INSPECTION INFORMATION

Page 21 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 5.5 : Looking South



T 5.5 : Looking North

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 5.5 : Looking West up stream



T. 5.5 : Looking East down stream



PHOTOGRAPHIC INSPECTION INFORMATION

Page 23 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 6.0 : Looking South



T 6.0 : Looking North



PHOTOGRAPHIC INSPECTION INFORMATION

Page 24 of 24

PROJECT NAME:

2015 MDT STREAM MITIGATION — FOYS BEND

DATE:

4/21/15



T 6.0 : Looking West up stream



T 6.0 : Looking East down stream



PHOTOGRAPHIC INSPECTION INFORMATION

Page 1 of 40

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T 0.5: Looking South



T 0.5: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T 0.5: Looking West up stream



T 0.5: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T 1: Looking South



T 1: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T1: Looking West up stream



T1: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T1.5: Looking South



T1.5: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T1.5: Looking West up stream



T1.5: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T2: Looking South



T2: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T2: Looking West up stream



T2: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T 2.5: Looking South



T 2.5: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T 2.5: Looking West up stream



T 2.5: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T3: Looking South



T3: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T3: Looking West up stream



T3: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T 3.5: Looking South



T 3.5: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T 3.5: Looking West up stream



T 3.5: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T4: Looking South



T4: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T4: Looking West up stream



T4: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T 4.5: Looking South



T 4.5: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T 4.5: Looking West up stream



T 4.5: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T5: Looking South



T5: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T5: Looking West up stream



T5: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T 5.5: Looking South



T 5.5: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T 5.5: Looking West up stream



T 5.5: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T6: Looking South



T6: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T6: Looking West up stream



T6: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T7: Looking South



T7: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T7: Looking West up stream



T7: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T8: Looking South



T8: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T8: Looking West up stream



T8: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T9: Looking South



T9: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T9: Looking West up stream



T9: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T10: Looking South



T10: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T10: Looking West up stream



T10: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T11: Looking South



T11: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T11: Looking West up stream



T11: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T12: Looking South



T12: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T12: Looking West up stream



T12: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T13: Looking South



T13: Looking North

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T13: Looking West up stream



T13: Looking East down stream

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T14: Looking south



T14: Looking north

PROJECT NAME: 2015 MDT STREAM MITIGATION — FOYS BEND

DATE: 8-25-15



T14: Looking West up stream



T14: Looking East down stream

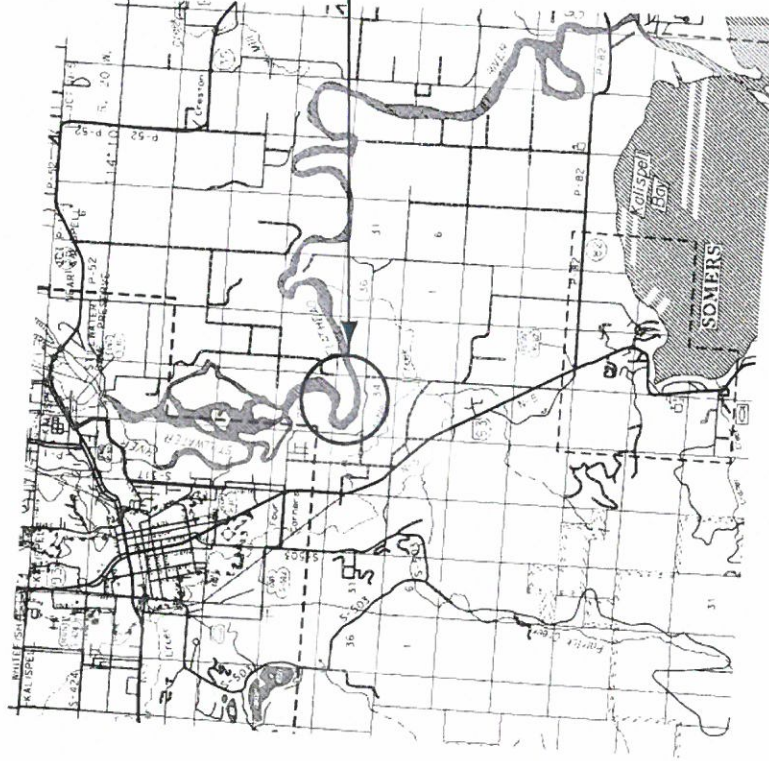
Appendix D

Foy's Bend Mitigation Design Sheets

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

THIS PROJECT

LENGTH	N/A	miles
100		
200		
300		
400		
500		
600		
700		
800		
900		
1000		
1100		
1200		
1300		
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9700		
9800		
9900		
10000		



THIS CONTRACT
AQUATIC RESOURCE MITIGATION
NH 15(99)

APPROVED : <u>January 14</u> 20 <u>13</u> TIM REARDON, DIRECTOR OF TRANSPORTATION	BY  BUREAU CHIEF ENVIRONMENTAL SERVICES	U.S. DEPARTMENT OF TRANSPORTATION FEDERAL HIGHWAY ADMINISTRATION	APPROVED : _____ DIVISION ADMINISTRATOR	MONTANA DEPARTMENT OF TRANSPORTATION THOMAS S. MARTIN 11228PE REGISTERED PROFESSIONAL
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FASCINES

ENCLOSURE FENCING

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BANK RESTORATION

PROJECT SITE OVERVIEW

BANK RESTORATION ZONE

RIPARIAN BUFFER ZONE #1

RIPARIAN BUFFER ZONE #2

FENCING COORDINATE TABLES

SHEET NO.

1

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2

3

4

4

4

4

4

5-11

5-6

7

8

9

10

11

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.

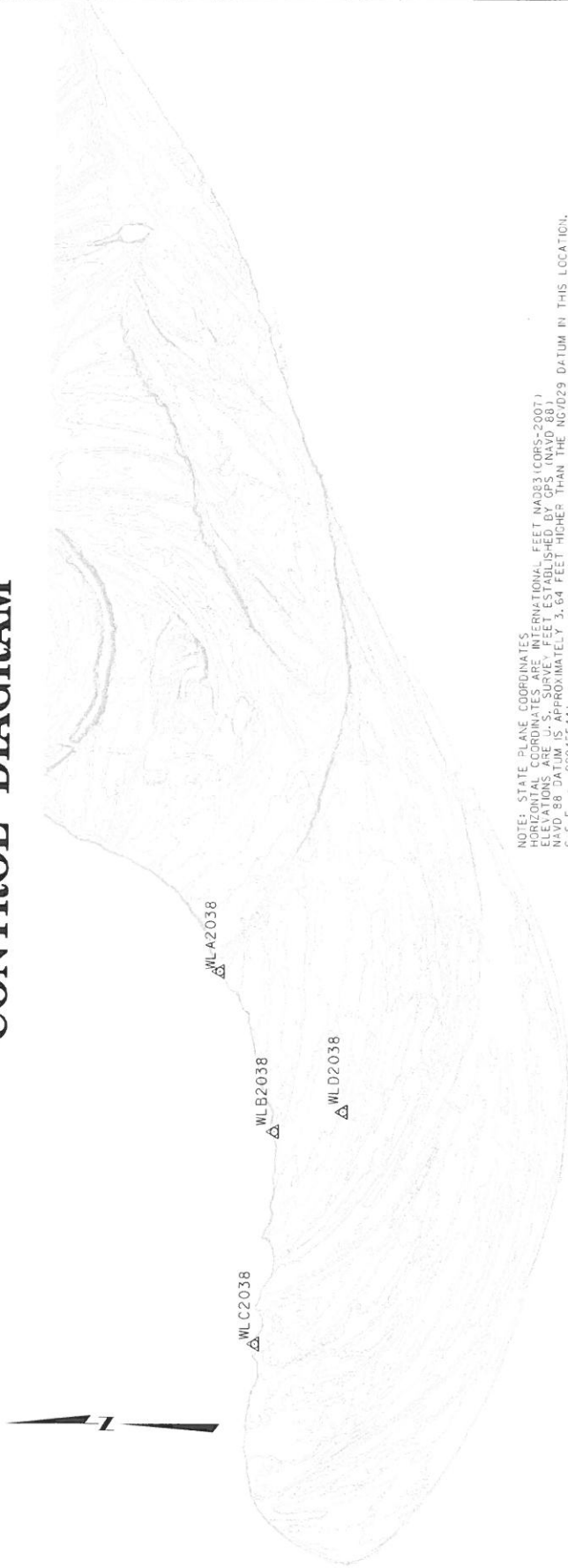
STAGING AREA

STAGING AREA LOCATION MUST BE APPROVED BY BOTH THE PROJECT MANAGER AND MT FISH, WILDLIFE, & PARKS (FMP); COORDINATE WITH FMP AT LEAST 2 WEEKS PRIOR TO CONSTRUCTION TO DETERMINE A LOCATION. FMP 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. NO PERMITS 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 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. = 999455441

NOTE: THE ELEVATIONS WERE ESTABLISHED FROM GPS OPUS SOLUTIONS AND ARE NEAR NAVD88 ELEVATIONS
LESS THAN 10 CM BETWEEN CONTROL POINTS WAS ESTABLISHED BY TERRESTRIAL MEASUREMENTS USING A TRIMBLE
56 ROBOTIC TOTAL STATION.

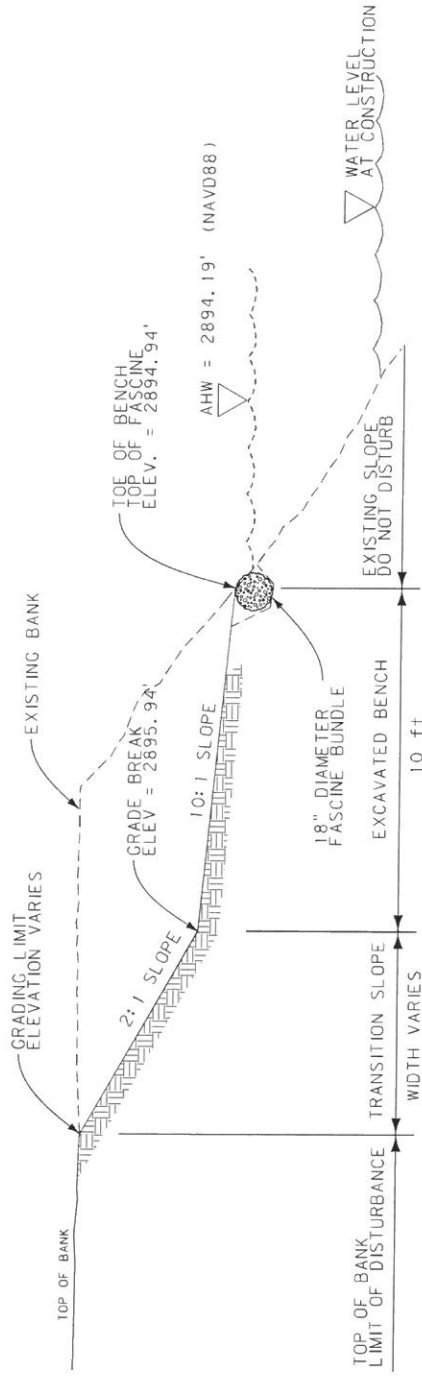
THIS PROJECT UTILIZES LIDAR SURVEY DATA COLLECTED BETWEEN SEPTEMBER 22 AND 29, 2009 AS PART OF THE FLATHEAD
CHANNEL MIGRATION ZONE STUDY COMMISSIONED BY THE MONTANA DEPARTMENT OF ENVIRONMENTAL QUALITY, MONTANA FISH,
WILDLIFE, AND PARKS, AND THE FLATHEAD LAKERS.

CONTROL MARK ABSTRACT

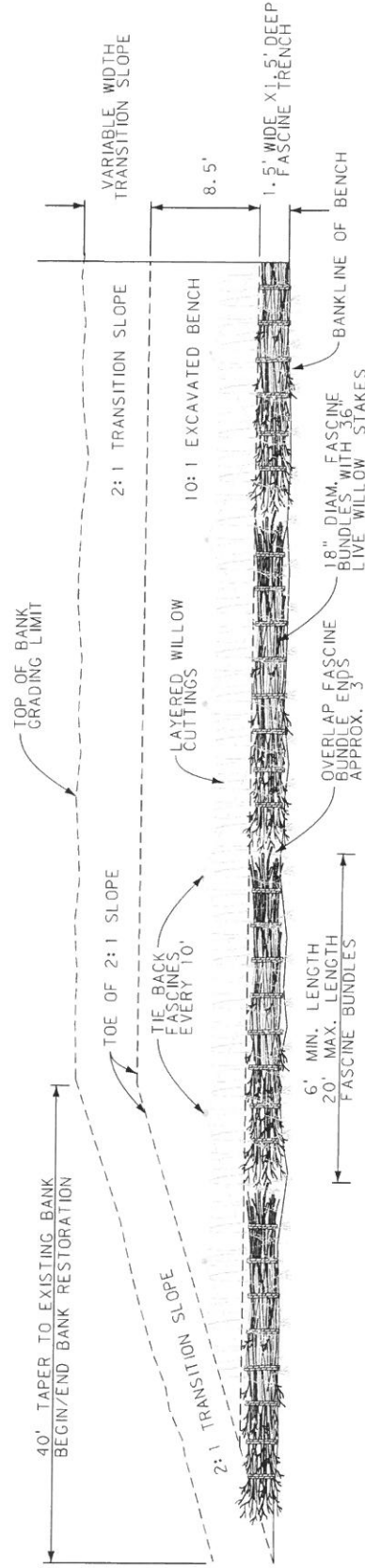
POINT NAME/NUMBER	N OR Y COORDINATE	E OR X COORDINATE	POINT ELEVATION	LOCATION AND DESCRIPTION
W2038	810,332.138	1,458,149.352	2,900.63	WLA2038 FROM THE INTERSECTION OF HOLT STAGE AND STEEL BRIDGE ROAD ON THE EAST SIDE OF THE NEWLY REPLACED OLD STEEL BRIDGE GO SOUTH ON STEEL BRIDGE ROAD 4.8 MILES TO A FWP PARKING CORAL WITH GREEN GATES. TURN WEST AND FOLLOW THE CORAL TO THE INTERSECTION OF THE CORAL AND THE FARM ROAD. TURN RIGHT ON THE FARM ROAD. 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 BANK. SET A 2" A.C. MARKED WLA2038 2012. WITNESS POST SET 3 FEET NORTH.
B2038	809,464.721	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 THE CORAL TO THE INTERSECTION OF THE CORAL AND THE FARM ROAD. TURN RIGHT ON THE FARM ROAD. 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 BANK. SET A 2" A.C. MARKED WLC2038 2012 WITNESS POST 3 FEET EAST.
D2038	805,588.808	1,457,489.729	2,901.38	WLD2038 FROM POINT WLB2038 GO 365 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.

BANK RESTORATION DETAIL

TYPICAL SECTION



PLAN VIEW

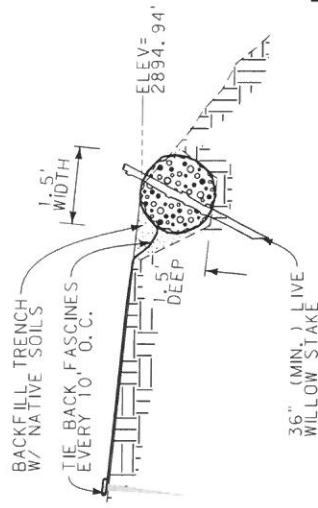


NOTE:
PREPARE 18" DIAMETER FASCINE BUNDLES WITH 1/2" TO 2" CONIFER SLASH & WILLOW CUTTINGS WITH ALL BRANCH ENDS FACING THE SAME DIRECTION. TIE EVERY 12" ON CENTER. POSITION END TO END AND OVERLAP ENDS APPROX. 3' OR MORE LEAVING NO GAPS BETWEEN BUNDLES. PLACE BUNDLES ENTIRELY WITHIN THE TRENCH AT THE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

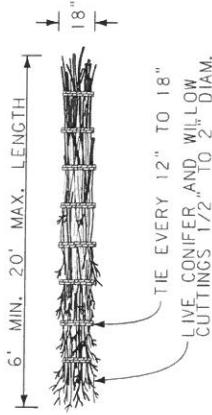
MDTA MONTANA DEPARTMENT OF TRANSPORTATION	DESIGNED BY: RUCB, SANCHEZ, PE 12/05/2012	F.O.Y.'S BEND STREAM MITIGATION UPN 2038013	NH 15 (99) SHEET 5
	CHECKED BY: W7713 11/14/2013 2:52:04 PM		

BANK RESTORATION DETAIL

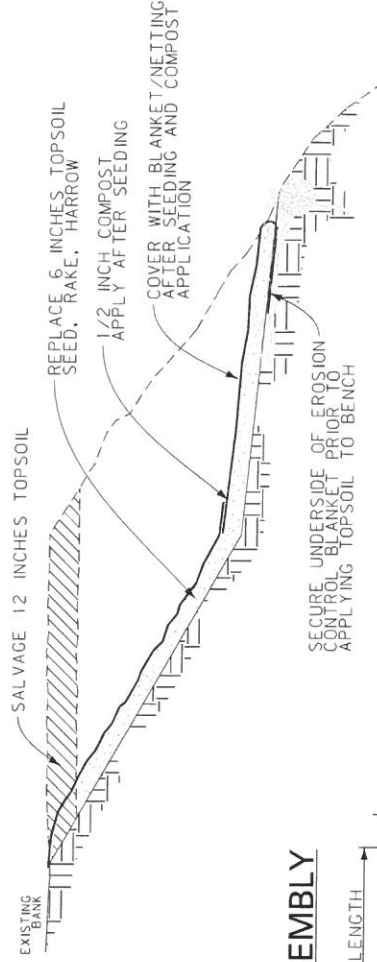
FASCINE INSTALLATION



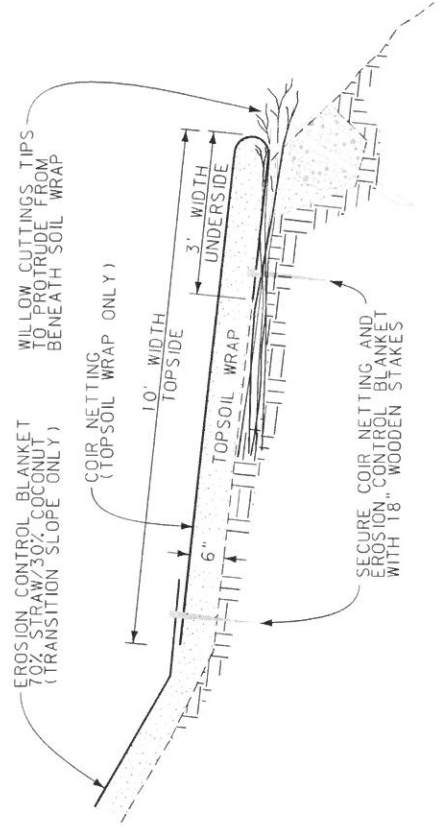
FASCINE ASSEMBLY



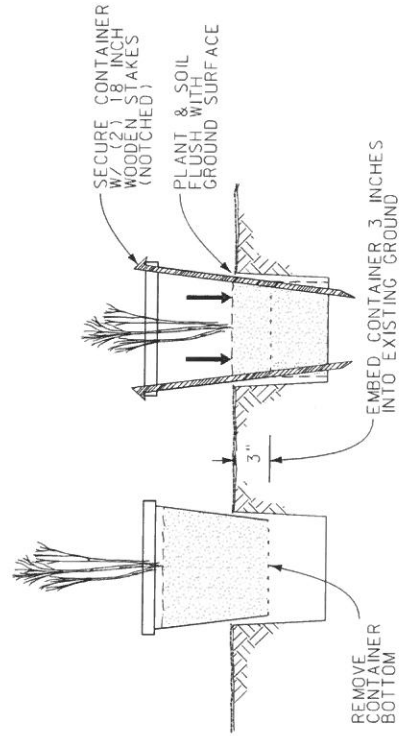
TOPSOIL SALVAGE & PLACE



TOPSOIL WRAP

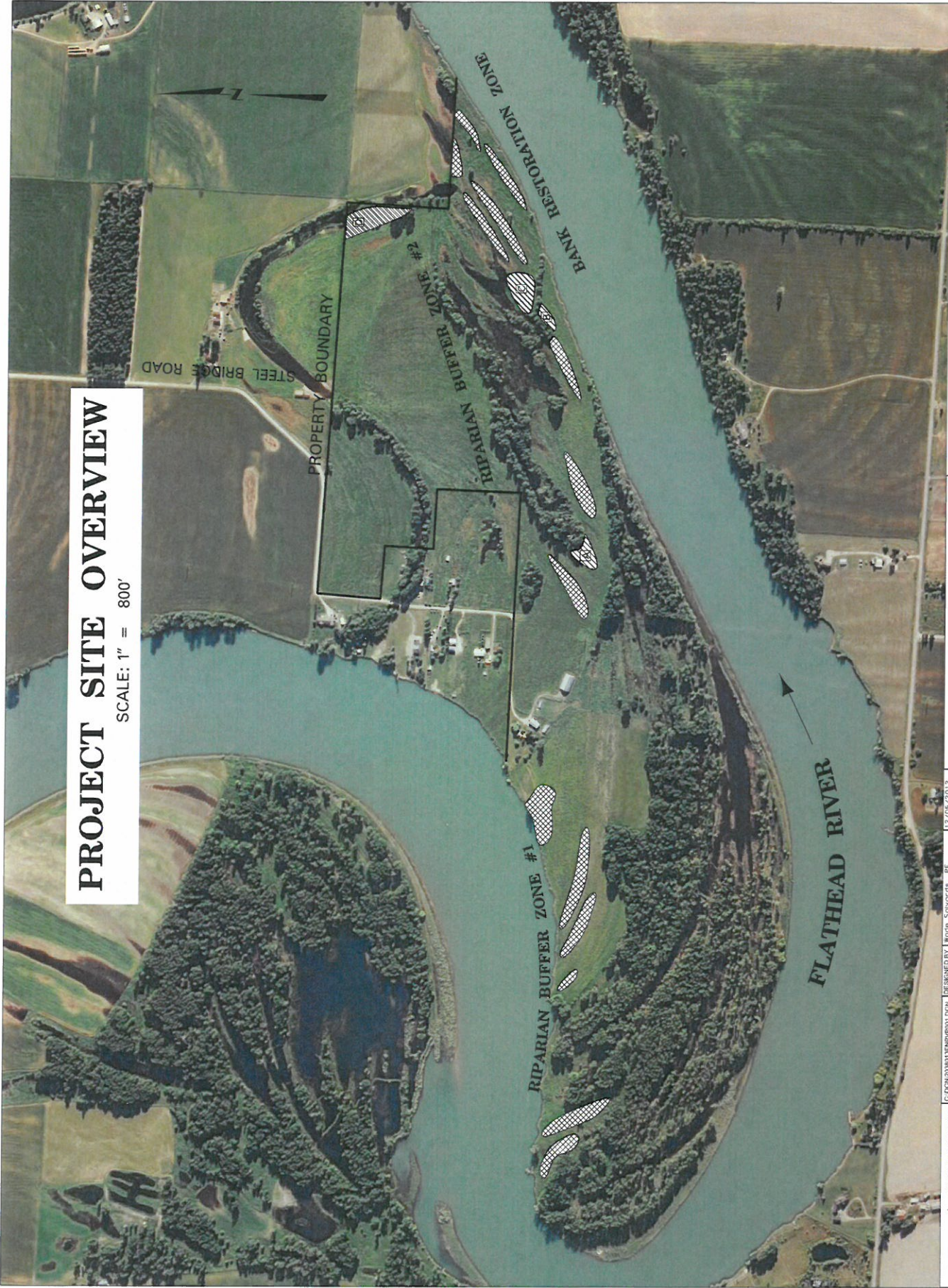


RODENT PROTECTION



PROJECT SITE OVERVIEW

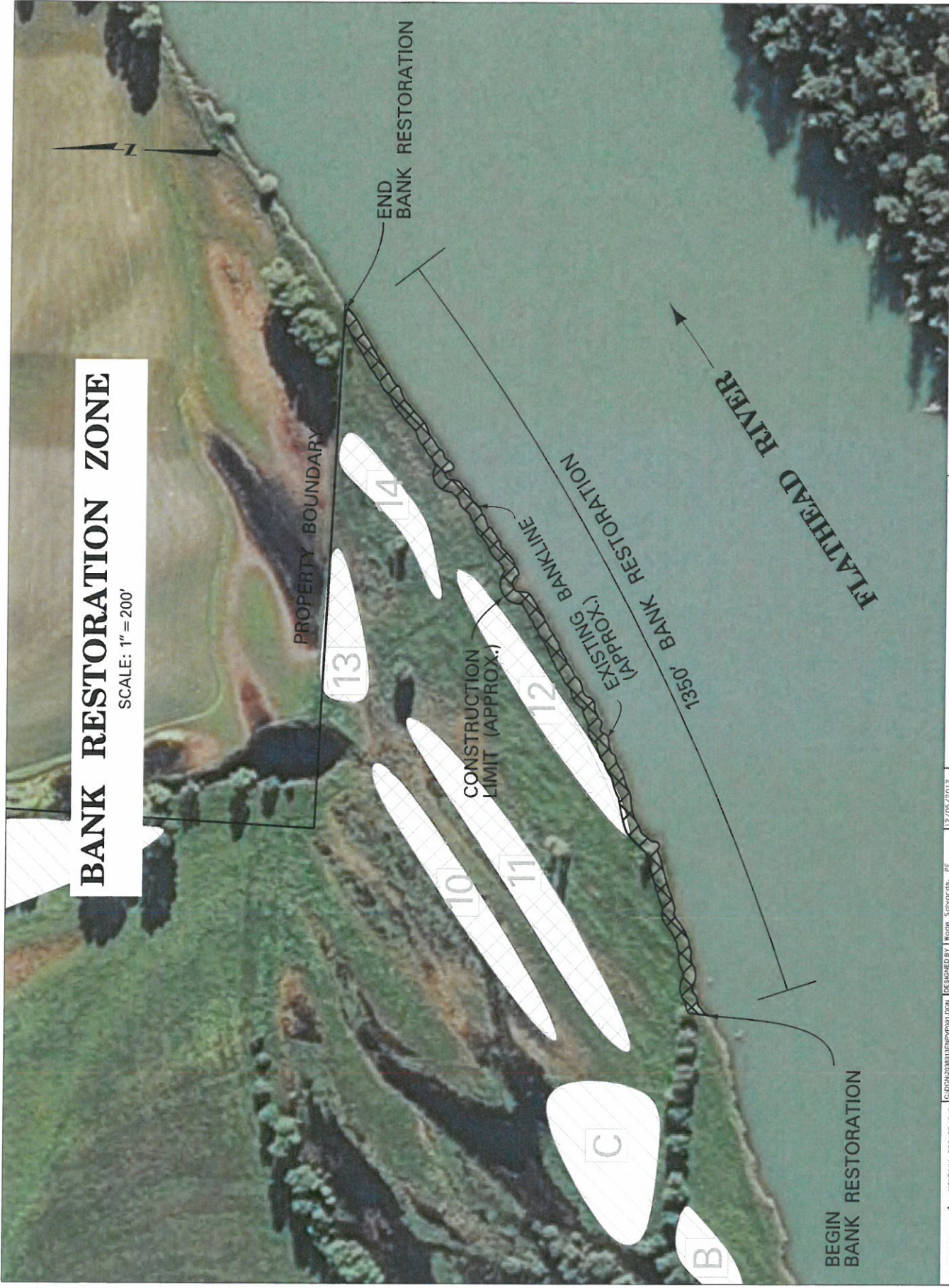
SCALE: 1" = 800'



MDTA MONTANA DEPARTMENT OF TRANSPORTATION	DESIGNED BY: MONTANA SURVEYING, INC. 12/20/2012	UPN 2038013	FOY'S BEND STREAM MITIGATION	NH 151931 SHEET 7
	CHECKED BY: 11/20/13 12:24:55 PM			

BANK RESTORATION ZONE

SCALE: 1" = 200'



MDTA MARYLAND DEPARTMENT OF TRANSPORTATION	C:\DATA\203801\TEMP\PROJ\LOGN 1/14/2013 8:50:18 AM	DESIGNED BY: BROOK S. SCHUCHTER, P.E. REVIEWED BY: CHECKED BY:	12/05/2012	UPN 2038013	FOY'S BEND STREAM MITIGATION	NH 151951 SHEET 8
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RIPARIAN AREA #1

SCALE: 1" = 400'

FLATHEAD RIVER

PROPERTY BOUNDARY



RIPARIAN AREA #1 PLANTING ZONES

PLANTING ZONE	PERL. METER (ft)	AREA (ac)
1	830	0.61
2	1070	0.99
3	410	1.18
4	1000	0.70
5	1430	1.04
6	960	1.17
TOTAL	5720	5.63

PLANT AND EXCLOSE PLANTING ZONES

FOY'S BEND STREAM MITIGATION

UPN 2038013

MM 15 (99)

SHEET 9

DESIGNED BY: BOB. S. L. O. C. S. E. 12/05/2012

REVIEWED BY: 07/13

DATE: 12/05/2012

MDTA

MINNAPOLIS

12/05/2012

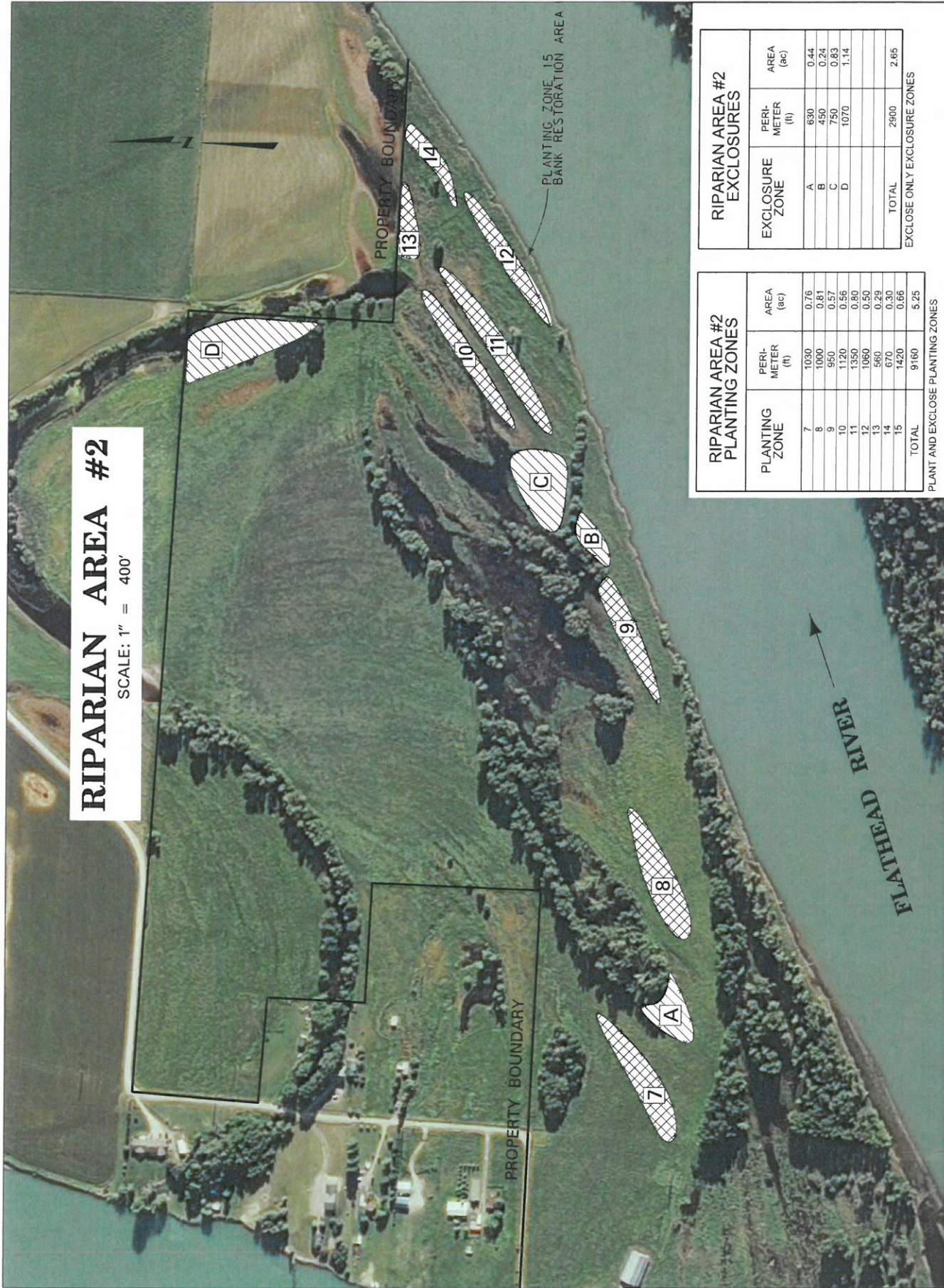
MINNAPOLIS

12/05/2012

12/05/2012

RIPARIAN AREA #2

SCALE: 1" = 400'



RIPARIAN AREA #2 PLANTING ZONES		
PLANTING ZONE	PERIMETER (ft)	AREA (ac)
7	1030	0.76
8	1000	0.61
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

RIPARIAN AREA #2 EXCLOSURES		
EXCLOSURE ZONE	PERIMETER (ft)	AREA (ac)
A	630	0.44
B	450	0.31
C	750	0.63
D	1070	1.14
TOTAL	2900	2.65

PLANT AND EXCLOSURE PLANTING ZONES

EXCLOSURE ONLY EXCLOSURE ZONES

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	1 457 845.604	807 904.405
1003	1	1 457 768.785	807 919.362
1004	1	1 457 715.402	808 011.301
1005	1	1 457 632.953	808 062.193
1006	1	1 457 816.174	808 006.564
1007	1	1 457 835.255	807 951.075
1008	1	1 457 966.668	807 788.842
1009	1	1 457 722.409	807 939.839
1010	2	1 457 935.419	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	808 266.765
1015	2	1 457 613.146	808 253.315
1016	2	1 457 784.338	808 179.978
1017	2	1 457 913.306	808 104.417
1018	3	1 457 815.531	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	1 457 856.852	808 587.368
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	1 457 640.195	809 531.872
1029	4	1 457 713.437	809 431.86
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	1 457 843.105	809 378.523
1041	6	1 458 067.178	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	1 457 870.367	809 981.716
1048	6	1 457 968.373	809 514.249
1049	6	1 457 995.907	810 018.245
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.

[illegible]

FENCING EXCLOSURE COORDINATES				
POINT	EXCLOSURE	N OR Y COORDINATE	E OR X COORDINATE	
1103	13	1 458 585.914	814 583.928	
1104	13	1 458 581.569	814 401.408	
1105	13	1 458 591.291	814 328.109	
1106	13	1 458 563.619	814 322.997	
1107	13	1 458 503.643	814 311.885	
1108	13	1 458 543.667	814 500.756	
1109	13	1 458 563.619	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	814 774.363	
1113	14	1 458 483.631	814 691.930	
1114	14	1 458 421.372	814 620.811	
1115	14	1 458 403.031	814 531.811	
1116	14	1 458 394.630	814 485.239	
1117	14	1 458 419.149	814 489.684	
1118	14	1 458 452.502	814 596.363	
1119	14	1 458 563.619	814 694.753	
1120	A	1 457 770.598	811 877.829	
1121	A	1 457 127.401	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	811 837.791	
1126	A	1 457 590.185	811 719.089	
1127	A	1 457 719.737	811 786.554	
1128	A	1 457 784.574	811 861.320	
1129	B	1 457 588.220	813 508.257	
1130	B	1 458 016.133	813 401.967	
1131	B	1 457 950.082	813 359.707	
1132	B	1 457 861.450	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	813 652.356	
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	813 910.693	
1152	D	1 459 293.177	814 912.163	
1153	D	1 459 283.109	814 035.872	
* 1154	15	1 457 950.000	813 986.000	
* 1155	15	1 459 560.000	813 986.000	