

Montana Department of Transportation Stream Mitigation Monitoring Report

FOY'S BEND FISHERIES CONSERVATION AREA

Project Overview

Watershed: Watershed #4 - Flathead

Monitoring Year: 2020

Years Monitored: 8th year of monitoring

Corps Permit Number: NWO-2009-01808-MTM

Monitoring Conducted By: Confluence Consulting Inc.

Monitoring Dates: July 31st – August 1st, 2020

Purpose of the approved project:

Foy's Bend Fisheries Conservation Area (FCA) mitigation project was created to offset stream and riparian impacts resulting from the Kalispell Bypass and other transportation projects in the Kalispell Region of the Missoula District. Specific project objectives were to: create 6,050 linear feet of riparian buffer by installing woody vegetation in 14 of 18 fenced enclosures, and to stabilize 1,350 feet of eroding bank on the Flathead River utilizing a soil lift and coir fascine.

Bank Treatment Site Location:

Upstream Coordinates: 48.153341, -114.2353694

Downstream Coordinates: 48.155196, -114.2306218

Enclosure Locations: See Appendix H

County: Flathead **Nearest Town:** Kalispell

Map Included: Yes

Mitigation Site Construction Started: 2013 **Construction Ended:** 2013

Dates of any recent corrective or maintenance activities (since previous report):

Activity: Noxious weed control **Date:** May 29, 2020

Specific recommendations for additional corrective actions: Enclosure fencing was repaired around several of the cells on July 20, 2020. To meet the established performance criteria, woody vegetation may need to be replanted and maintained, and the portions of the riverbank may need to be stabilized.

Previous Monitoring Reports and Methods Descriptions:

<https://www.mdt.mt.gov/publications/brochures/stream-mitigation.shtml>

Requirements (from approved mitigation plan, banking instrument, or DA permit conditions)

Monitoring Period: 5 years from construction completion or until concurrence by US Army Corps of Engineers (USACE).

Performance Standards:

Results from the 2020 monitoring event indicate the Foy's Bend FCA stream mitigation site is meeting six of the nine performance standards established in the monitoring plan. The site met the criteria for total cover within the riparian and streambank buffers, as well as for noxious weed. The site failed to meet the success criteria established for planted woody vegetation survival and cover, and density of willow growth from the installed willow mats. While the restored bank is meeting the success criteria over the entire monitoring period, the bank erosion performance criteria were not met along 27% of the bank since last year's monitoring event and the 2020 monitoring data indicate that this trend is likely to continue.

Table 1. Summary of Performance Standards

Performance Standards	Success Criteria	Criteria Achieved Y/N	Discussion
Riparian Buffer Success	Areas within creditable riparian buffer disturbed during construction must have at least 50% areal cover of non-noxious plant species	Y	All 18 riparian exclosures exhibit >50% cover of non-noxious species, riparian exclosures exhibit 91.5% cover by non-noxious species
	Combined areal cover of riparian and stream bank vegetation communities is at least 70%	Y	Combined areal cover of riparian and stream bank vegetation is 95.8%
	Noxious weeds do not exceed 5% cover within the riparian buffer areas	Y	4.3% noxious weed cover was observed within riparian buffers
	Planted trees and shrubs must exhibit 50% survival after 5 years	N	Eight years following planting, 30% of planted woody species are surviving
	Woody Plants: Planted trees and shrubs must exhibit 50% aerial coverage after 5 years	N	2.7% cover of woody plantings observed within planted riparian exclosures
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	N	Approximately 27% (370 feet) of the treated bank length eroded at a rate > 1.5 feet/year over the last year and is considered "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	Y	Approximately 73% of the bank eroded at a rate < 1 foot/year over the last year and is considered "Functioning".
	Proper Functioning Condition Rating = Functional	NA	Complete PFC assessment was not conducted in 2020, as it was not the final year of monitoring.
Willow Mats	Density of new willow stem growth achieves 50% aerial coverage after five years	N	Density of new willow growth along reconstructed bank segment is approximately 1%
Vegetation along Riverbank	Majority of plants on the riverbank must have root stability indices of at least 6	Y	Dominant vegetation along the majority of the stream bank is reed canary grass (<i>Phalaris arundinacea</i>), with a root stability index of 9.
Weed Control	Montana State-listed noxious weeds do not exceed 5% cover within the bank restoration and riparian planting zones.	Y	4.3% noxious weed cover observed within riparian exclosures

* Pritchard (1998)

Summary Data

Riparian Vegetation Inventory – Four riparian belt transects were inventoried for percent vegetation cover. Data collected at each transect was considered representative of one or more of the 18 riparian exclosure areas, based on their pre-treatment condition and mitigation activity. Therefore, transect data was used to determine if the performance standards were met in each of the 18 exclosures.

Minimal change in vegetation cover was observed along the four riparian belt transects and the single stream bank belt transect in 2020 as compared to previous years (Table 2). There was a minimal increase in bare ground observed along all four transects, likely a result of herbicide applications from 2018 through 2020. Transect locations and exclosure boundaries are presented on Figures 4, 5, and 6 in Appendix A.

Table 2. Percent cover of vegetation transects at the Foy's Bend stream mitigation site in 2013, and 2018 through 2020.

Belt Transect	Location	Transect Type	Length (ft.)	Total % Vegetation Cover			
				2013	2018	2019	2020
1	Exclosure 2	Riparian	274	100	98	98	95
2	Exclosure 6	Riparian	425	100	98	97	96
3	Exclosure 8	Riparian	230	100	97	97	95
4	Exclosure 18	Riparian	275	100	96	96	95
5	Stabilized riverbank	Streambank	1350	63	98	98	96

Transects 1 and 2 are representative of the 14 exclosures planted with woody vegetation. A length-based weighted average of vegetation cover for these two transects (96%) was assigned to exclosures 1-7, 9, 10, and 13-17. Transect 3 is representative of the three exclosures that were not planted and contained no naturally occurring woody vegetation prior to the mitigation project. The vegetation cover for Transect 3, estimated at 95%, was assigned to riparian exclosures 8, 11, and 12. These three exclosures are intended to promote natural woody vegetation development due to their proximity to existing stands of aspen (*Populus tremuloides*) and cottonwood (*Populus balsamifera*). Transect 4 was in the only riparian exclosure (#18) that was not planted but had naturally occurring woody vegetation in it prior to the mitigation project. Therefore, the vegetation cover from Transect 4, estimated at 95%, is representative of exclosure 18 only. This exclosure was also unique because it was established for MDT by FWP prior to the project. Table 3 presents the acreage for each riparian exclosure area and its areal percent cover of total vegetation. The area-weighted-average of total vegetation cover for all riparian exclosure areas is approximately 96% (Table 4).

The vegetation belt transect along the riverbank (Transect 5) was 1,350 feet long, 10 feet wide, and covered approximately 0.3 acres. It is aligned parallel and immediately adjacent to the Flathead Riverbank on the southern boundary of the project area (Figure 6, Appendix A). As shown in Table 2, total vegetation cover of the stream bank transect was 96%, representing an increase by 33% since the initial monitoring event in 2013. Bare ground was primarily observed in areas that had been previously sprayed with herbicide and in areas where soil was stripped from the river's edge of the coir wrapped bank. Table 4 presents a summary of vegetation cover for all riparian exclosure and stream bank transects combined.

Table 3. Exclosure acreage and total percent riparian cover at the Foy's Bend stream mitigation site in 2013, and 2018 through 2020.

Exclosure	Planted	Acres	Total % Vegetation Cover			
			2013	2018	2019	2020
1	Yes	0.74	100	98	97	96
2	Yes	1.06	100	98	97	96
3	Yes	0.34	100	98	97	96
4	Yes	0.87	100	98	97	96
5	Yes	1.20	100	98	97	96
6	Yes	1.23	100	98	97	96
7	Yes	0.93	100	98	97	96
8	No	0.56	100	97	97	95
9	Yes	1.16	100	98	97	96
10	Yes	0.67	100	98	97	96
11	No	0.26	100	97	97	95
12	No	0.91	100	97	97	95
13	Yes	0.75	100	98	97	96
14	Yes	0.89	100	98	97	96
15	Yes	0.55	100	98	97	96
16	Yes	0.41	100	98	97	96
17	Yes	0.34	100	98	97	96
18	No	1.22	100	96	96	95
Total		14.1	100	98	97	96

Table 4. Area-weighted-average of areal vegetation cover for riparian and stream bank transects at the Foy's Bend stream mitigation site in 2013, and 2018 through 2020.

Area Type	Acres	Total % Vegetation Cover			
		2013	2018	2019	2020
Riparian					
Exclosures	14.1	100	97.7	96.9	95.8
Streambank	0.3	63	98	98	96
Total	14.4	99.3	97.7	96.9	95.8

Table 5. Vegetation community types observed at Foy's Bend stream mitigation site in 2020.

Community Type	Dominant Species
2	<i>Populus</i> spp.
4	<i>Alopecurus arundinaceus</i> / <i>Poa pratensis</i>
5	<i>Bromus inermis</i> / <i>Symphoricarpos albus</i>
6	<i>Phalaris arundinacea</i> / <i>Symphoricarpos albus</i>
8	<i>Bromus inermis</i> / <i>Poa pratensis</i>
9	<i>Phalaris arundinacea</i>
11	<i>Elymus repens</i> / <i>Poa pratensis</i>
12	<i>Poa pratensis</i> / <i>Populus tremuloides</i>
13	<i>Phalaris arundinacea</i> / <i>Populus tremuloides</i>
16	<i>Phalaris arundinacea</i> / <i>Alopecurus arundinaceus</i>
17	<i>Elymus repens</i> / <i>Alopecurus arundinaceus</i>
18	<i>Elymus repens</i> / <i>Phalaris arundinacea</i>

Twelve vegetation community types were identified in 2020 (Table 5). Mapped vegetation communities found in each enclosure area are presented on Figures 7 and 8 (Appendix A). In 2020, vegetation community types in all enclosures remained consistent with those observed during the 2019 monitoring event. Ten of the twelve community types are dominated by species with a wetland indicator status of FAC and/or FACW, indicating these communities are more hydrophytic than community types 5 and 8 which are dominated by species with a wetland indicator status of FAC, FACU, and/or UPL (Appendix C).

In 2020, 134 plant species were observed at the Foy's Bend stream mitigation site (Appendix C). This is an increase of 1 species since 2019, and 72 species since the initial monitoring event in 2013. Spiny plumeless-thistle (*Carduus acanthoides*), a non-native biennial upland species, was observed for the first time in 2020. In 2020, 50 of the species identified on site were hydrophytic based on the National Wetland Plant List (NWPL) (USACE 2018).

Stream Bank Vegetation Composition – In 2020, 54 plant species were observed along vegetation transect 5, running the length of the reconstructed stream bank (Appendix D). The dominant vegetation present along the bank is reed canary grass, which has steadily increased in cover since the initial monitoring event and now comprises greater than 50% cover of the stream bank vegetation transect. Reed canary grass is an aggressive, perennial plant species that outcompetes surrounding vegetation and diminishes overall species diversity. While it decreases habitat complexity, it does provide effective resistance to erosion through a dense rhizomatous root system (i.e., stability index scores 9 out of 10). Spreading bent (*Agrostis stolonifera*) and lesser bladder sedge (*Carex vesicaria*), with root stability indices of 3 and 9, respectively, provide a lesser amount of cover (6-10%) along the bank, and all remaining species were observed at less than 5% cover.

Noxious Weed Inventory – Seven Montana State-listed Priority 2B noxious weeds were observed within the Foy's Bend project area in 2020 (Appendix E). A total of 42 infestations of Canada thistle (*Cirsium arvense*), one infestation of oxeye daisy (*Leucanthemum vulgare*) and field bindweed (*Convolvulus arvensis*), and four infestations of yellow toadflax (*Linaria vulgaris*) were mapped. All infestations had between 1 and 5 percent cover and were assigned a cover class of "low" (Appendix A). Isolated occurrences of houndstongue (*Cynoglossum officinale*), leafy spurge (*Euphorbia esula*), common tansy (*Tanacetum vulgare*), Canada thistle, oxeye daisy, field bindweed, and yellow toadflax were also observed, but not mapped. While these isolated occurrences were sparse, their total combined areas are included in the estimated percent cover of noxious weeds within each riparian enclosure.

Percent cover of noxious weeds within each riparian and stream bank enclosure, was estimated at 4.3% (Appendix E), which is an increase of 0.7% since the 2019 monitoring event. MDT has an ongoing weed-management program for the site that includes annual monitoring of noxious weed infestations and herbicide application for those mapped locations. The continued weed management efforts have been effective in decreasing overall noxious weed cover across the mitigation site since monitoring began.

Woody Plant Survival – Planted woody vegetation survival was determined by recording the total number of live and dead planted shrubs and trees observed within each riparian enclosure. Table 6 provides the total number of plants observed, number of alive or stunted within each riparian enclosure in 2020 and planted woody survival rates observed in 2013 through 2020. In 2020, survival rates within each enclosure ranged from 12% to 57% while the total woody planting survival was 30%. Survival rates dropped in eight of the 14 planted areas over the past year, while the remaining six enclosures exhibited higher survival rates. In 2020, increased and decreased survival rates may have been influenced by previous mowing of herbaceous vegetation within enclosures and weed management efforts, which likely decreased the competition of surrounding vegetation. Overall, high mortality rates are a result of vole herbivory, adverse effects from herbicide treatment, and aggressive competition from species like

reed canary grass and creeping meadow-foxtail. Twenty-four percent of the inspected plants were stunted, which included those that exhibited poor vigor, were affected by herbicide applications, or were sprouting from the base of the plant.

Table 6. 2020 planted woody vegetation inventory and survival rates for 2013 through 2020.

Exclosure Number	Total Plants Inspected (2020)	# of Healthy Plants (2020)	# of Stunted Plants (2020)	% Stunted Plants (2020)	% Survival							
					2013	2014	2015	2016	2017	2018	2019	2020
1	135	23	12	34	96	74	41	38	41	40	25	26
2	258	59	11	16	70	60	18	37	32	26	28	27
3	50	8	1	11	92	56	19	53	25	28	19	18
4	187	87	13	13	97	60	28	32	47	51	43	53
5	97	24	4	14	97	56	19	32	12	60	18	29
6	108	34	11	24	84	76	25	25	17	55	17	42
7	90	8	3	27	88	57	23	23	13	15	23	12
9	168	15	8	35	92	75	47	35	31	51	21	14
10	141	22	21	49	97	85	64	42	30	50	50	30
13	104	16	13	45	93	69	41	18	14	16	27	28
14	135	22	15	41	95	76	37	22	13	67	29	27
15	77	37	3	8	97	69	22	21	36	58	71	52
16	77	10	2	17	96	61	30	22	33	43	26	16
17	51	22	7	24	99	65	43	25	41	29	37	57
Total	1678	387	124	24	91	68	32	31	25	37	29	30

Table F-1 (Appendix F) provides a summary of percent cover by volunteer woody species within each of the 18 exclosures from 2014 through 2020, and the total percent cover of volunteer woody species within all 18 exclosures in 2020. Between 2019 and 2020, percent cover of volunteer woody species increased in five exclosures and remained constant in 13 exclosures. Averages of these data indicate approximately 12.5 percent cover is being provided by woody volunteers within all 18 exclosures in 2020.

Table F-2 (Appendix F) provides the total percent woody cover, including woody volunteers and woody plantings observed within all exclosures in 2020. These data indicate approximately 2.7 percent cover from woody plantings within all 14 planted exclosures, 12.5 percent cover from woody volunteers within all 18 exclosures, and 15.2 percent total woody cover across all 18 exclosures.

Flathead River Bank and Treatment Stability – The reconstructed portion of the Flathead River bank was monitored in April 2020 to document bank conditions when the lake level was low prior to spring runoff, and in July 2020 when the lake level was high. Twenty-two perpendicular transects along the upper bank were surveyed (see survey plots in Appendix G) and photographed (Appendix B) during both monitoring events. Bathymetric surveys of the lower bank and river channel were also conducted during the July monitoring event (Appendix G). Estimates of bank retreat rates are provided in Table 7.

Over the past several years, erosion has been observed and documented along this bank, especially on the upstream end. The types of erosion previously observed include internal erosion from soil piping, rill erosion, wave erosion, and mass wasting; all of which are described in previous monitoring reports. Although not directly observed, it is also assumed that this bank is subject to wind erosion and bank scour in the winter from river ice. The dominant erosive force along this bank is wave action which causes soil sloughing and mass wasting along areas of the bank that are unprotected by either bank treatments or vegetation. Active erosion from wave action was directly observed during the July 2020 monitoring event when a large motorboat repeatedly passed by the bank leaving a large wake.

For the purposes of describing the reconstructed bank segment, it has been divided into three reaches based on conditions observed during previous site visits (Figure 7, Appendix A). The following sections describe monitoring data documented within each of the three reaches as well as immediately upstream of the reconstructed bank. Bank profiles surveyed at each transect, and a longitudinal profile of fascine elevations can be found in Appendix G.

Erosion Upstream of Reconstructed Bank – Erosion has been monitored at three transects (-0.5, 0, 0.5) upstream of the treated bank since 2016, where approximately 775 feet of bank is actively eroding (Figures 2 and 5, Appendix G). This bank segment has often exhibited higher erosion rates as compared to transects downstream (Table 7). The majority of erosion observed in this reach is in the uppermost portion of the bank and extends downstream far enough to intercept the reconstructed bank where it has begun to influence the stability of Reach 1, and has captured a portion of the protective fencing installed around a revegetated area (see photo point 5.1 and survey photos 14 & 15, Appendix B). Over the survey timeframe, Transect -0.5 has exhibited the highest bank retreat rate when compared to all other transects surveyed. Between 2016 and 2020, Transect -0.5 retreated by 12.2 feet (3.1 feet/year). The bank is also retreating at Transects 0.0 and 0.5, although at a slower pace; 1.5-2 feet per year. The trend of rapid bank retreat the upstream reach continued in 2020, when the bank retreated 1-2 feet between April and July (Table 7). Since this reach is not treated or reconstructed portion of the mitigation project, it is not compared against the success criteria.

Reach 1 – Reach 1 spans the upstream 235 feet of reconstructed bank and contains five transects (Transects 1-3; Figure 2). Annual surveys of these transects indicate that upper portions of the reconstructed bank that were re-sloped and revegetated remain stable but that the lower portions of the bank have retreated by an average of 4.6 feet since 2013 (Table 7). The average annual retreat rate of lower bank is approximately 0.6 feet/year which is considered “functional” in the performance standards (less than 1 foot annually). However, the average retreat rate across the Reach 1 transects was 2.2 feet per year since 2019, which would be considered “Functional at Risk” in the performance criteria. Additionally, the area beneath the bank treatments has become vertical and is susceptible to undercutting and bank failure (Appendix G). Bank failures were observed at Transects 2.5 and 3, where the bank slumped and retreated by approximately three feet between April and July 2020 (Table 7; Appendix G). The bank has now retreated past the edge of the coir mat at these transects and remains quite steep between the low and high-water elevations. The increased bank retreat observed over the 2020 summer is primarily attributed to undercutting beneath the reconstructed portion of the bank, which has caused the fascines and coir soil lift to slump down in elevation by an average of 0.8 feet over the last year. Erosion is expected to continue along these transects at a relatively rapid pace now that the bank is no longer protected by the bank treatments.

Reach 2 – Reach 2 is 135 feet long and is represented by Transects 3.5 through 4.5 (Figure 2). Although the re-sloped and revegetated upper portions of the reconstructed bank remain stable, severe bank erosion beneath the woody fascines was observed in Reach 2 between 2013 and 2017, and the fascines became detached from the bank. Due to the loss of bank protection from the fascines, the bank has eroded more rapidly over the past three years. The leading edge of the bank has retreated 1-2 feet over the past year, and between 9 and 11 feet since monitoring began in 2013 (Appendix G). The average retreat rate for Reach 2 is 1.2 feet/year over the monitoring period, which is considered “functional at risk” in the performance standards. Bank retreat is expected to continue in Reach 2 given the lack of bank protection beneath the treated area.

The elevation of the woody fascine in Reach 2 continued to drop over the past year and is now between 6.0 and 8.4 feet below the design elevation (Table 7). The woody fascine has continued to slump due to undercutting and soil loss beneath the bank treatment. Extended transect surveys indicate that the

submerged toe of the bank has moved northward 5-7 feet between 2016 and 2020 and is therefore likely contributing to the soil loss beneath the bank treatment in Reach 2.

Table 7. Bank retreat rates and fascine elevations for 22 perpendicular bank transects over the entire monitoring period and Summer 2020.

Reach	Transect	Bank retreat 2013-2020*	Bank retreat April-July 2020	Fascine Elevation April 2020	Fascine Elevation Change from Design (ft)	Fascine Elevation Change from 2019 (ft)
Upstream	-0.5	12.2	0.6	NA	NA	NA
	0	7.0	2.0	NA	NA	NA
	0.5	6.5	1.7	NA	NA	NA
	Average	8.6	1.4	NA	NA	NA
1	1	3.4	1.5	2893.2	1.8	0.2
	1.5	1.6	0.1	2891.1	3.8	2.0
	2	2.9	1.1	2894.0	0.9	0.3
	2.5	9.6	3.0	2889.3	5.6	0.1
	3	5.4	3.2	2891.7	3.2	1.3
	Average	4.6	1.8	2891.9	3.1	0.8
2	3.5	9.5	1.2	2886.5	8.4	4.8
	4	10.5	1.7	2887.5	7.4	2.6
	4.5	9	2.1	2889.0	6.0	1.0
	Average	9.7	1.7	2887.7	7.3	2.8
3	5	1	0	2894.1	0.8	0.3
	5.5	1.6	0.4	2894.5	0.4	0.4
	6	3.8	1.3	2893.9	1.0	0.2
	7	3.5	0.5	2893.6	1.4	0.5
	8	3.1	1.1	2894.0	0.9	0.3
	9	2.6	0.8	2894.0	0.9	0.0
	10	1.5	0.9	2894.4	0.6	0.1
	11	1.4	1.2	2894.1	0.8	0.4
	12	2.6	0.3	2893.5	1.4	0.0
	13	2.3	1.3	2893.6	1.4	0.3
	14	3.2	0.2	2893.7	1.2	0.8
	Average	2.4	0.7	2893.9	1.0	0.3

*Bank retreat rates shown for the Upstream reach were for 2016-2020

Reach 3 – Reach 3 contains 1,000 feet of the reconstructed bank and is represented by transects 5-14. The upper, re-sloped portion of the reconstructed bank above the soil lift in Reach 3 has maintained a stable configuration with no documentation of lateral erosion. The lower portion of the bank has eroded some, but at much lower erosion rates than in all the other reaches. The average lateral erosion rate since 2013 was 2.4 feet, which equates to 0.3 feet per year for Reach 3. This erosion rate is considered “functional” in the performance standards. Individual transects have eroded laterally between 1.0 and 3.8 feet during the monitoring period, with the highest amounts of erosion having been observed at transects 6-8 and transect 14 (Table 7). However, increased erosion of up to 1.3 feet was observed at individual transects between the April and July 2020 monitoring events, indicating that the lower banks in this reach may be trending toward becoming less stable. On average, the elevation of the woody fascine in Reach 3 has only dropped slightly since 2019 and has only dropped about 1 foot since 2013 (Table 7).

Extended bank transects indicate some variability in bank slope, thalweg location, and bed features below the low water elevation, but the bank toe does not appear to be trending northward (Appendix G). The majority of the Reach 3 transect plots indicate that there may be an interannual trend, where sediment accumulates at the toe of the bank between April and July/August and then washes away over the fall and winter months. As such, it is unlikely that movement of the bank toe is contributing to soil losses along the bank between the summer high and winter low water elevations. Erosion below the bank treatment area in Reach 3 is primarily attributed to wave action against the fine-grained soils.

Conclusions

The performance criteria for the Foys Bend FCA mitigation site were partially met in 2020. The vast majority of disturbed areas have successfully revegetated with desirable, non-noxious species, and the plant communities found on site are well established.

Performance criteria pertaining to woody vegetation have thus far not been met. The failure of the woody vegetation success criteria is largely due to poor establishment of planted woody vegetation. It is unclear why establishment and survival of planted woody species was so low, but competition from aggressive species such as reed canary grass, vole herbivory, and mortality from herbicide applications are likely contributors.

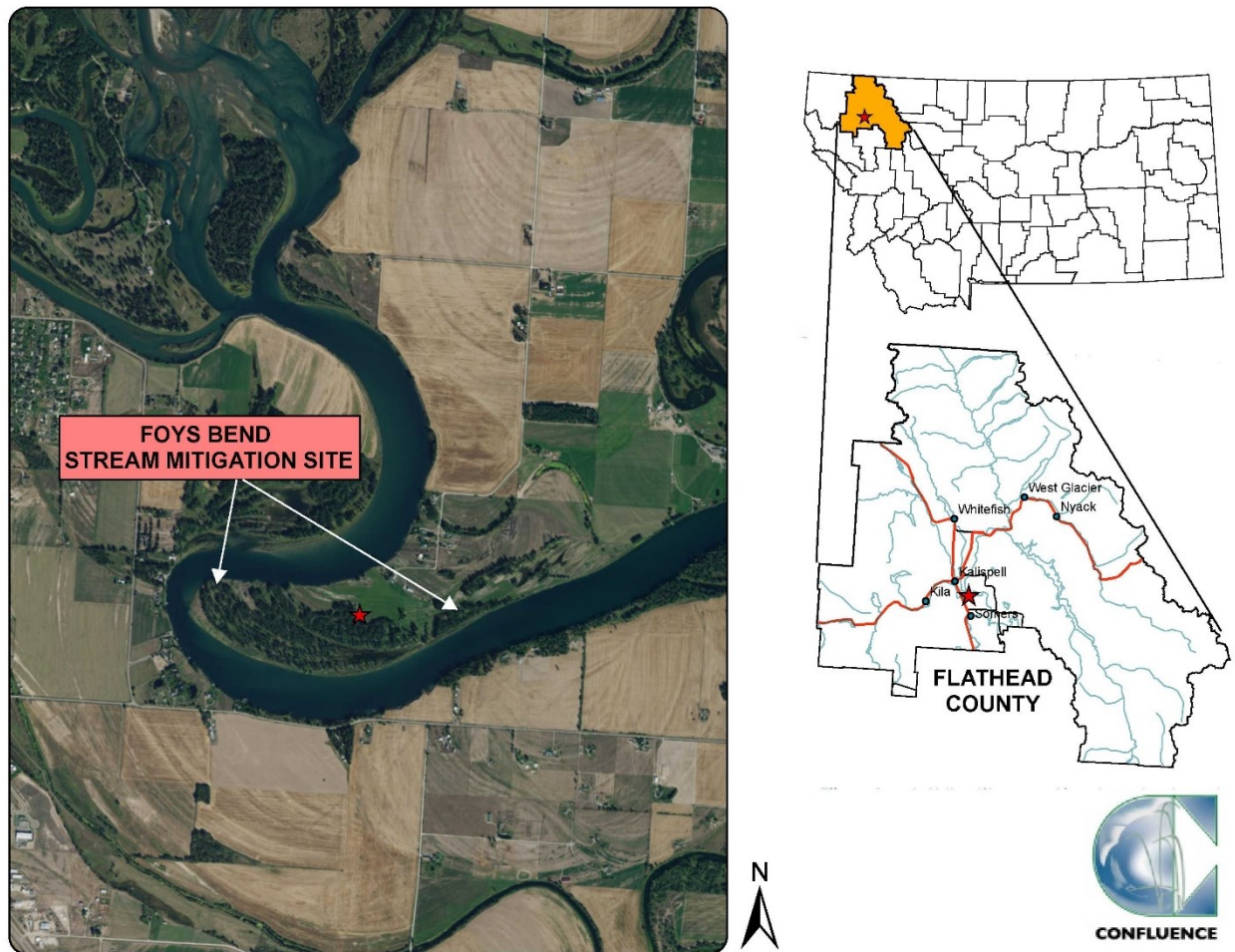
Bank stability criteria are being met for approximately 73% of the restored stream bank. Performance criteria are not applied to the reach upstream of the stabilized riverbank, but this portion of bank is also quite unstable - potentially due to a short segment of riprap that was placed immediately upstream of transect -0.5. This riprap now extends well into the river and may create an erosive eddy when Flathead River flows are high. Transect -0.5 has consistently had the highest erosion rates of any transect throughout time. The untreated reach upstream of Reaches 1 and 2 has consistently exhibited high erosion rates and bank erosion possibly due to lower bank scouring from the eddy. Bank retreat in this area has begun to capture the upstream-most portion of the treated bank and the protective fencing around it. Continued erosion upstream of the treated bank may result in additional loss of the upper bank within the treated reach. The soil lift and fascine bank treatments that were installed to protect the riverbank are located at an elevation that is typically below the summer high-water lake level and above the winter low-water lake level. Because the bank treatments are below the water level, the bank is directly exposed to significant amounts of wave erosion during the summer as it is bare in many places. While the upper bank is well vegetated, the vegetation community consist of species such as orchard grass (*Dactylis glomerata*), smooth brome, spreading bent grass, and Kentucky blue grass. The height of the bank exceeds the rooting depth of these species and therefore, the vegetation present along the bank offers virtually no protection from erosive forces exerted laterally on the bank. Minimal vegetation exists along the lower bank, including below the bank treatments, due to the frequency and duration of inundation during high lake levels and in this area.

The original design for the fascines and reconstructed banks specified that these features be installed over a wide range of elevations to account for fluctuating water levels in Flathead Lake, but various permitting agencies limited the design elevations to the mean summer water level. Since 2015, the elevation of the woody fascine below the soil lift has consistently dropped to between one and three feet below the design elevation (i.e. the assumed constructed elevation). Fascine elevation drops have been more drastic in Reaches 1 and 2, where the fascine elevations are now an average of 3.5 and 7.8 feet below the design elevation, respectively (Table 7, Appendix G). The lowering of the fascine is primarily the result of slope failure beneath the fascine causing the leading edge of the reconstructed

bank to slump into the river, although settling of the soils beneath the fascines and of the woody fascines themselves may also have contributed. The slope has failed because it is completely unprotected and drops steeply into the Flathead River. Any material that sloughs off of the bank and deposits at the toe, is washed away by swift river currents when the lake levels are low. This cycle prevents the formation of a supportive sub-surface bank, and therefore the bank continues to undercut. Without solid bank material to hold the soil lift and fascine in place, the fascine will continue to fall further into the water.

Maps, Plans, Photos:

Figure 1. Site Location Map



Project Area Maps/Figures: See Appendix A

Photos: See Appendix B

Comprehensive Plant List: See Appendix C

Stream Bank Vegetation Composition: See Appendix D

Noxious Weed Species List: See Appendix E

Woody Plant Survival: See Appendix F

Reconstructed Bank Transect Plots: See Appendix G

Planting Exclosure Coordinates: See Appendix H

Plans: See Appendix E of 2013 Monitoring Report

https://www.mdt.mt.gov/other/webdata/external/planning/STREAM-MITIGATION/2013_REPORTS/2013_FOYSBEND_MONITORING_REPORT.PDF

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Montana Department of Agriculture. June 2019. *Montana Noxious Weed List*. Accessed October 2020 at:
<https://agr.mt.gov/Portals/168/Documents/Weeds/201920Montana20Noxious20Weed20List.pdf?ver=2019-07-02-095540-487>

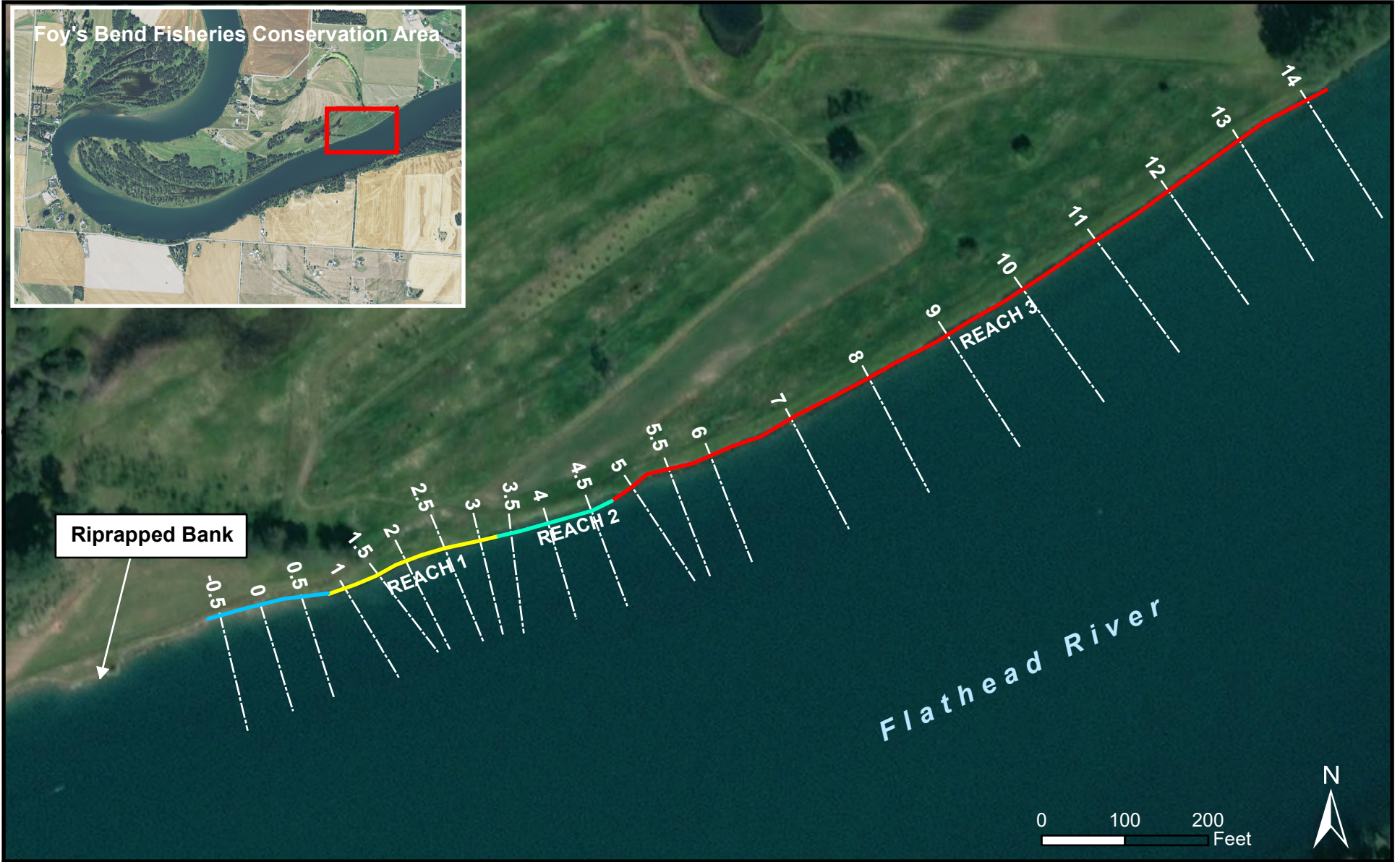
Prichard, D., J. Anderson, C. Correll, J. Fogg, K. Gebhardt, R. Krapf, S. Leonard, B. Mitchell, and J. Staats. 1998. *Riparian Area Management: A User Guide to Assessing Proper Functioning Condition and the Supporting Science for Lotic Areas*. Technical Reference 1737-15. U.S. Department of the Interior, Bureau of Land Management, Denver, CO. 126 pp.

U.S. Army Corps of Engineers (USACE). 2018. *National Wetland Plant List* (Version 3.4), prepared by U.S. Army Corps of Engineers, U.S. Army Engineer Research and Development Center, Cold Regions Research and Engineering Laboratory, Hanover, NH

APPENDIX A

PROJECT AREA MAPS

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



Legend

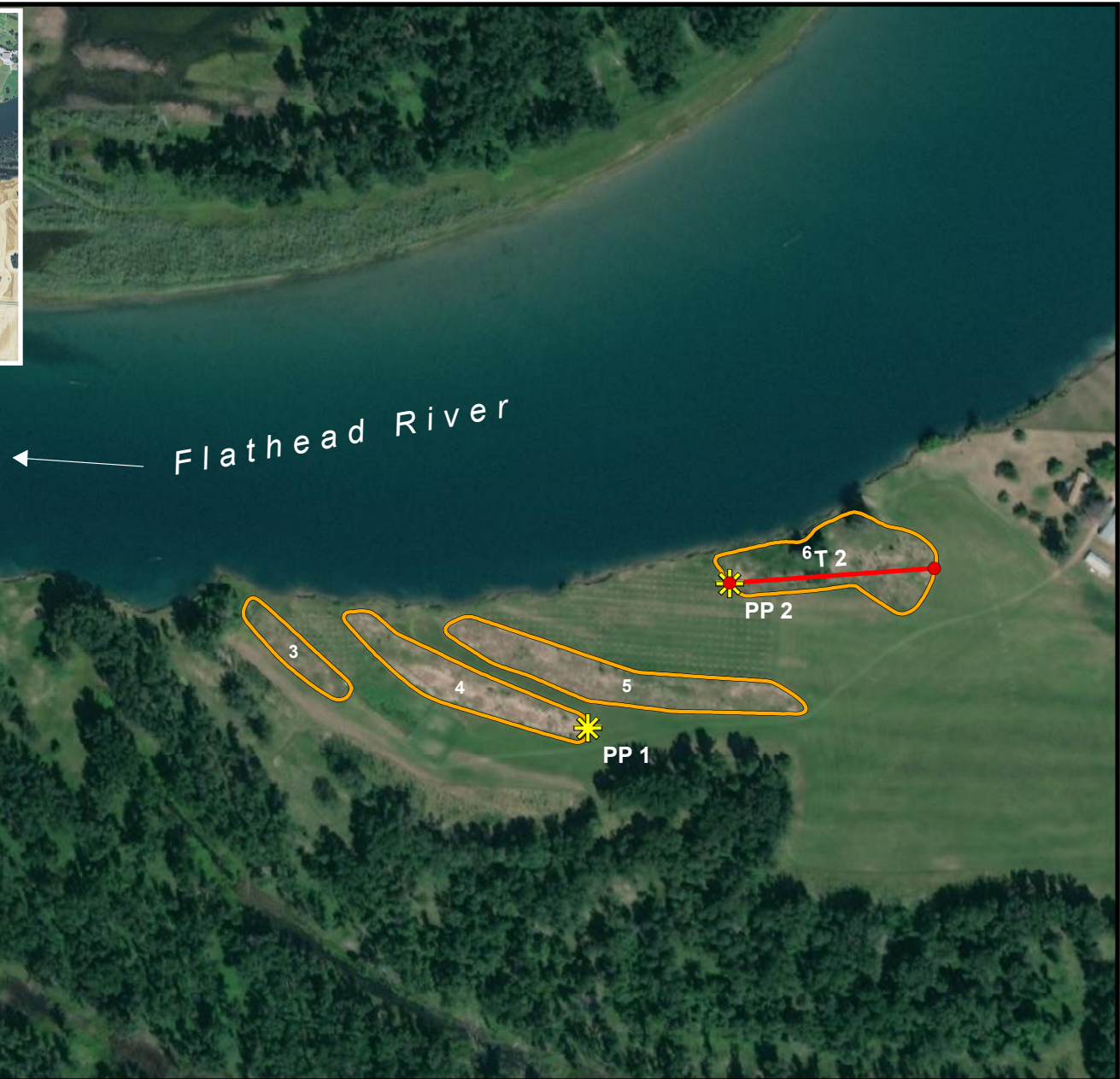
- Reconstructed Bank - Reach 1
- Reconstructed Bank - Reach 2
- Reconstructed Bank - Reach 3
- Reach Upstream of Bank Treatment
- Surveyed Bank Transects

**Foys Bend
2020 Surveyed
Bank Transects**




Figure 2

Date: 12/23/20

2020 Bank Surveys.mxd



Legend

-  Photo Points
-  Exclosures
-  Riparian Transects

0 100 200 300 400 500
Feet

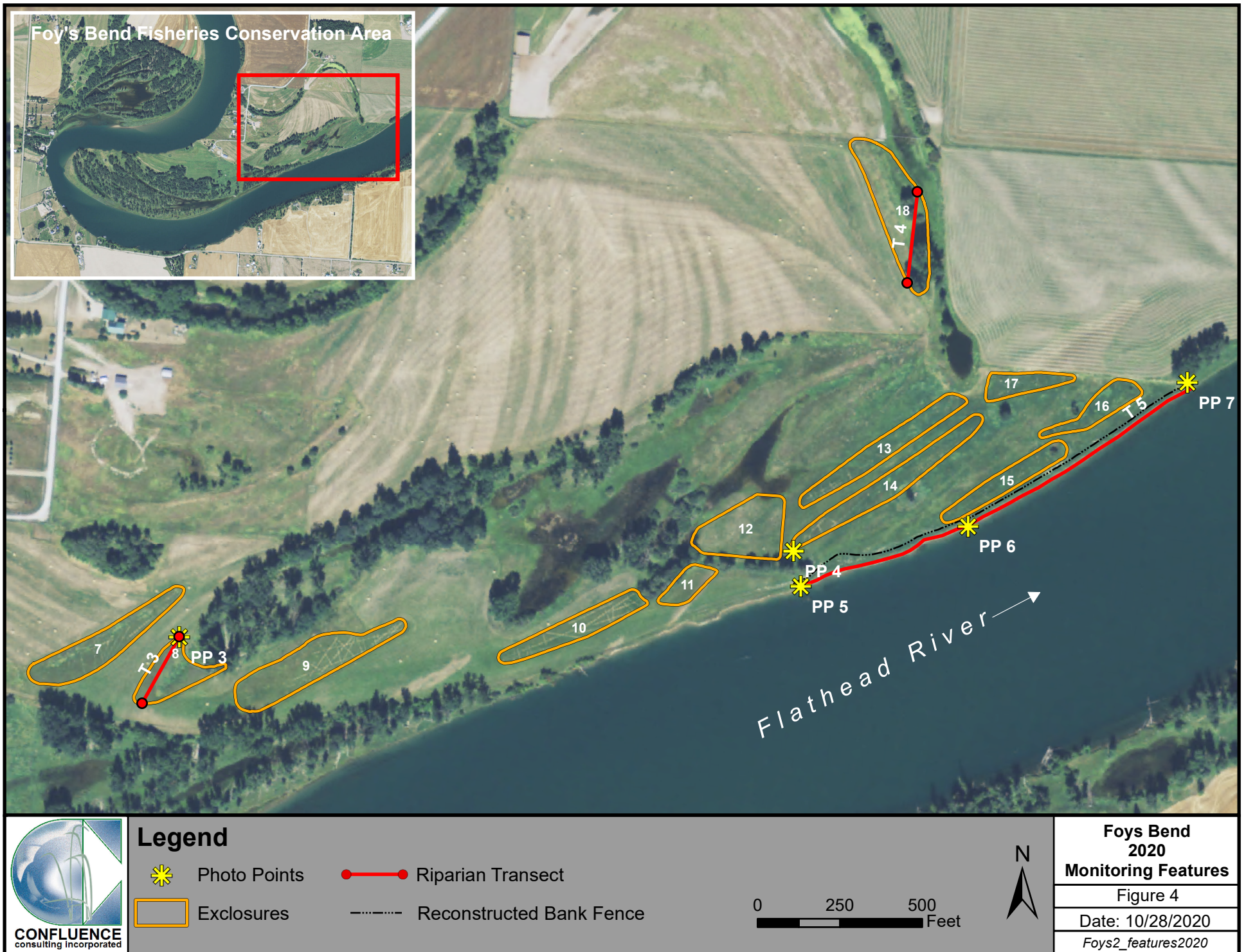


**Foy's Bend
2020
Monitoring Features**

Figure 3

Date: 10/28/2020

Foys1_features2020





Legend



Photo Points



Exclosures



Vegetation Transect #5 along reconstructed bank



Perpendicular Bank Profiles



Reconstructed Bank Fenceline

0 100 200 300
Feet

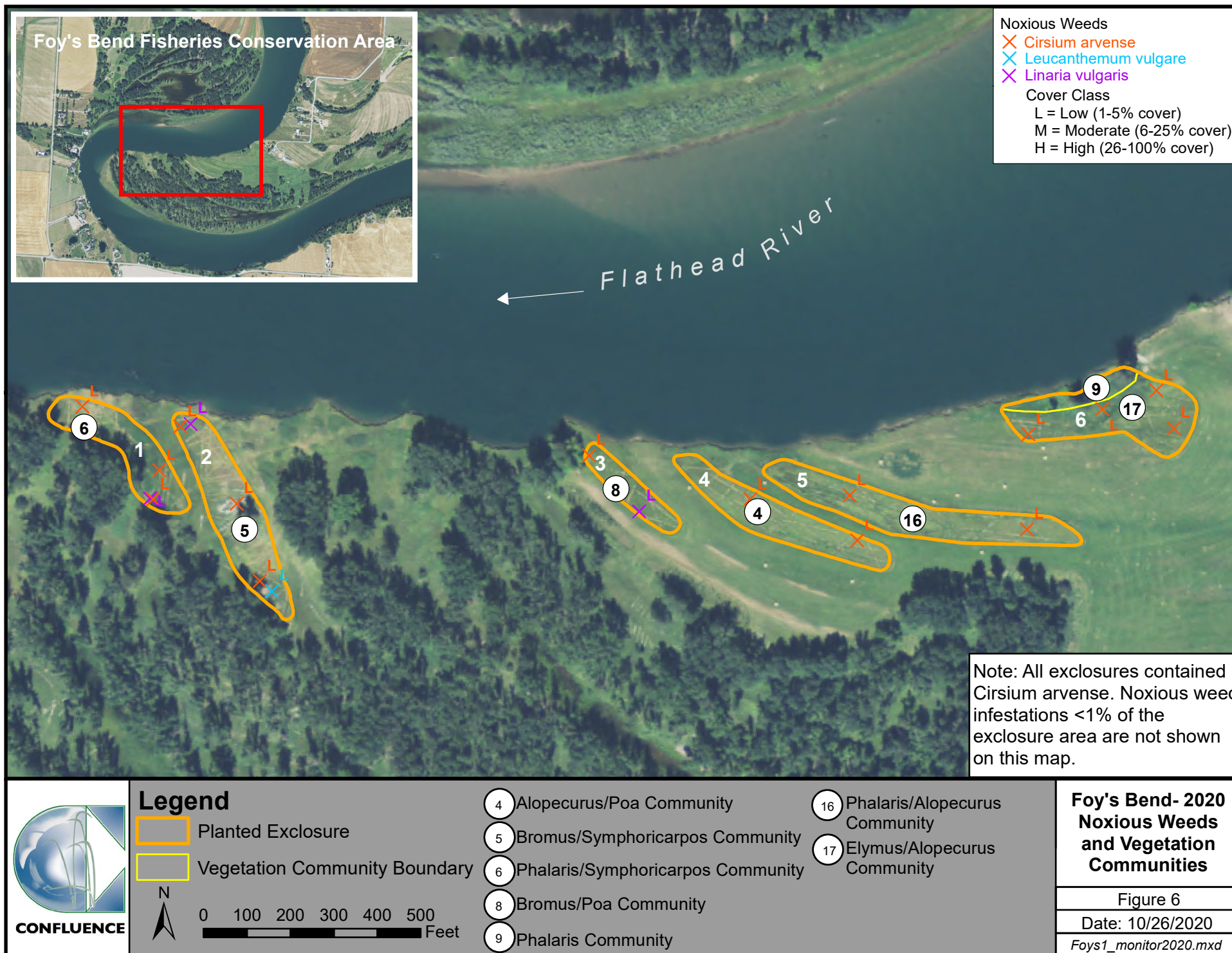


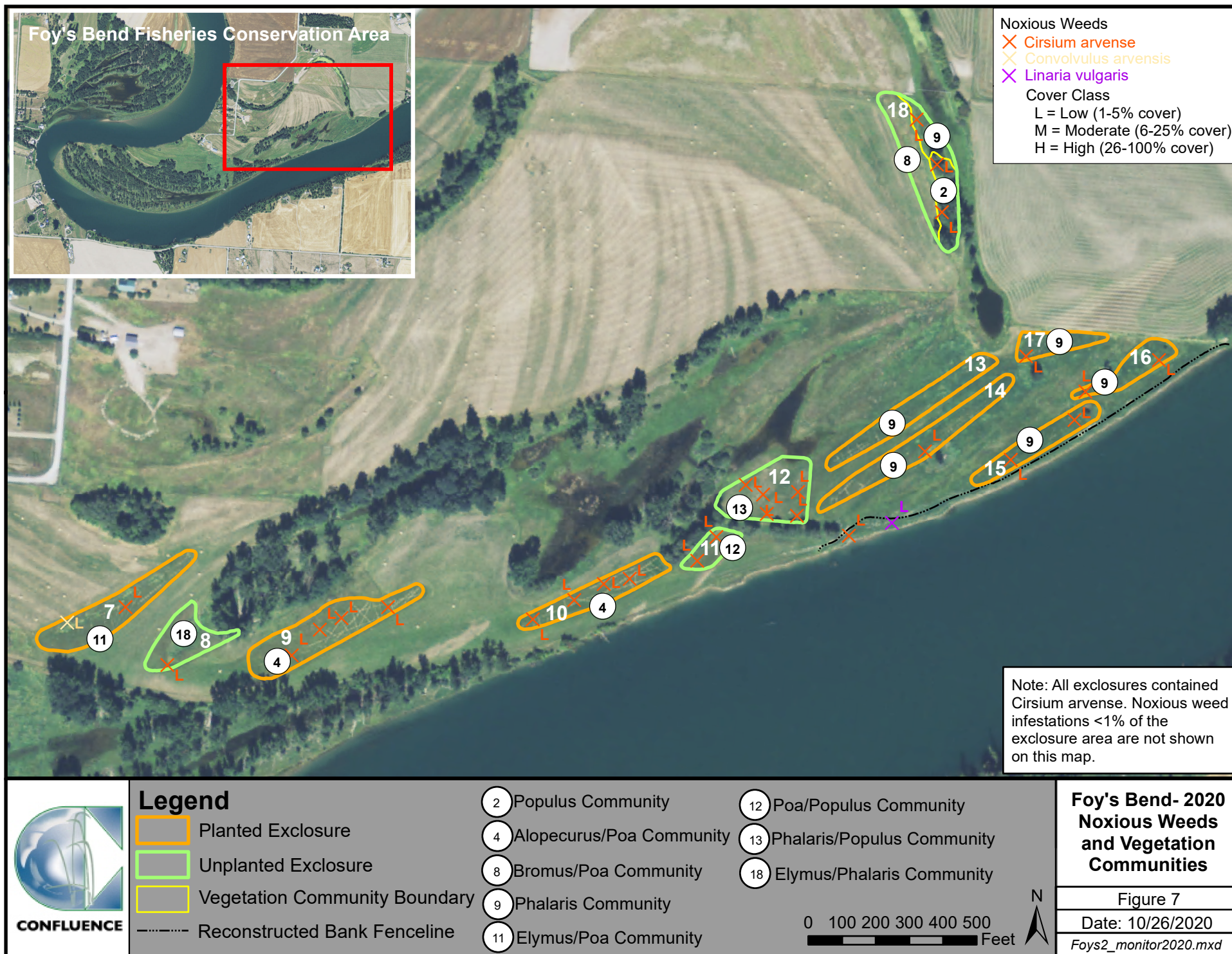
Foy's Bend 2020 Monitoring Features

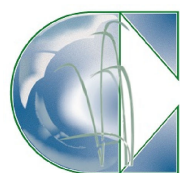
Figure 5

Date: 10/2/2020

Foy3_features2020







CONFLUENCE

Legend

- Planted Exclosure
- Perpendicular Bank Profile
- Reconstructed Bank Fenceline

0 100 200 300 Feet



Foy's Bend- 2020 Noxious Weeds and Stream Bank Transects

Figure 8

Date: 10/26/2020

Foys3_monitor2020.mxd

APPENDIX B

PROJECT AREA PHOTOGRAPHS

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

MONITORING PHOTO LOG

SITE NAME: Foy's Bend
MONITORING YEARS: 2013 and 2020



2013



2020

Photo 1: Exclosure 4, looking northwest.



2013



2020

Photo 2: Exclosure 6, looking east.



2013



2020

Photo 3.1: Exclosure 8 looking southeast.

MONITORING PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2013 and 2020



2013



2020

Photo 3.2: Exclosure 8 looking south-southeast.



2013



2020

Photo 3.3: Exclosure 8, looking south-southwest.



2013



2020

Photo 4: Exclosure 14, looking east.

MONITORING PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2013 and 2020



2013



2020

Photo 5.1: Upstream extent of restored stream bank looking upstream (west).



2013



2020

Photo 5.2: Upstream extent of restored stream bank looking downstream (northeast).



2013



2020

Photo 6.1: Middle of restored stream bank, looking upstream (west).

MONITORING PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2013 and 2020



2013



2020

Photo 6.2: Middle of restored streambank looking downstream (northeast).



2013



2020

Photo 7: Downstream end of restored stream bank, looking upstream (west).



July 2020

Additional Photo 1: Bank sloughing near Transect 3.5



July 2020

Additional Photo 2: Bank calving off behind coir soil lift at Transect 4.

MONITORING PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2013 and 2020



April 2020

Additional Photo 3: Flathead River bank upstream of treatment reach.



April 2020

Additional Photo 4: Looking downstream from riprap outcrop above bank stabilization.



April 2020

Additional Photo 5: Looking upstream at cross section 1.5 from bottom of bank.



April 2020

Additional Photo 6: Looking downstream at cross section 2.5 from bottom of bank.



April 2020

Additional Photo 7: Looking downstream at cross section 4.5 from bottom of bank.



April 2020

Additional Photo 8: Exposed planting in eroding bank.

MONITORING PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2013 and 2020



April 2020

Additional Photo 9: Looking upstream at cross section 5.5 from bottom of bank.



April 2020

Additional Photo 10:



April 2020

Additional Photo 11: Looking upstream at cross section 2.



April 2020

Additional Photo 12: Looking south at cross section -0.5.



April 2020

Additional Photo 13: Looking downstream at cross section 3.5.



April 2020

Additional Photo 14: Looking downstream at cross section 9.

MONITORING PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2013 and 2020



April 2020

Additional Photo 15: Looking north at cross section 1.5.



April 2020

Additional Photo 16: Looking north at cross section 2.5.



April 2020

Additional Photo 17: Looking north at cross section 3.5.



April 2020

Additional Photo 18: Looking northwest at cross section 14.

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



August 2016



July 2020

Survey Photo 1: T -0.5 Looking North



August 2016



July 2020

Survey Photo 2: T -0.5 Looking West



August 2016



July 2020

Survey Photo 3: T -0.5 Looking East

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



August 2016



July 2020

Survey Photo 4: T 0.0 Looking North



August 2016



July 2020

Survey Photo 5: T 0.0 Looking West



August 2016



July 2020

Survey Photo 6: T 0.0 Looking East

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



August 2015



July 2020

Survey Photo 7: T 0.5 Looking North



August 2015



July 2020

Survey Photo 8: T 0.5 Looking West



August 2015



April 2020

Survey Photo 9: T 0.5 Looking East

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



July 2014



July 2020

Survey Photo 10: T 1.0 Looking West



July 2014



July 2020

Survey Photo 11: T 1.0 Looking East



August 2015



July 2020

Survey Photo 12: T 1.5 Looking North

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



August 2015



July 2020

Survey Photo 13: T 1.5 Looking West



August 2015



July 2020

Survey Photo 14: T 1.5 Looking East



July 2014



July 2020

Survey Photo 15: T 2.0 Looking North

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



July 2014



July 2020

Survey Photo 16: T 2.0 Looking West



July 2014



July 2020

Survey Photo 17: T 2.0 Looking East



August 2015



July 2020

Survey Photo 18: T 2.5 Looking North

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



August 2015



July 2020

Survey Photo 18: T 2.5 Looking West



August 2015



July 2020

Survey Photo 19: T 2.5 Looking East



August 2015



July 2020

Survey Photo 20: T 3.0 Looking North

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



July 2014



July 2020

Survey Photo 21: T 3.0 Looking West



July 2014



July 2020

Survey Photo 22: T 3.0 Looking East



August 2015



July 2020

Survey Photo 23: T 3.5 Looking North

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



August 2015



July 2020

Survey Photo 24: T 3.5 Looking West



August 2015



July 2020

Survey Photo 25: T 3.5 Looking East



August 2015



July 2020

Survey Photo 26: T 4.0 Looking North

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



July 2014



July 2020

Survey Photo 27: T 4.0 Looking West



July 2014



July 2020

Survey Photo 28: T 4.0 Looking East



August 2015



July 2020

Survey Photo 29: T 4.5 Looking North

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



August 2015



July 2020

Survey Photo 30: T 4.5 Looking West



August 2015



July 2020

Survey Photo 31: T 4.5 Looking East



July 2020

Survey Photo 32: T 5.0: Looking North

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



July 2014



July 2020

Survey Photo 33: T 5.0 Looking West



July 2014



July 2020

Survey Photo 34: T 5.0 Looking East



August 2015



July 2020

Survey Photo 35: T 5.5 Looking North

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



August 2015



July 2020

Survey Photo 36: T 5.5 Looking West



August 2015



July 2020

Survey Photo 37: T 5.5 Looking East



July 2014



July 2020

Survey Photo 38: T 6.0 Looking North

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



July 2014



July 2020

Survey Photo 39: T 6.0 Looking West



July 2014



July 2020

Survey Photo 40: T 6.0 Looking East



July 2014



July 2020

Survey Photo 41: T 7.0 Looking North

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



July 2014



July 2020

Survey Photo 42: T 7.0 Looking West



July 2014



July 2020

Survey Photo 43: T 7.0 Looking East



July 2014



July 2020

Survey Photo 44: T 8.0 Looking North

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



July 2014



July 2020

Survey Photo 45: T 8.0: Looking West



July 2014



July 2020

Survey Photo 46: T 8.0 Looking East



July 2014



July 2020

Survey Photo 47: T 9.0 Looking North

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



July 2014



July 2020

Survey Photo 48: T 9.0 Looking West



July 2014



July 2020

Survey Photo 49: T 9.0 Looking East



August 2015



July 2020

Survey Photo 50: T 10.0 Looking North

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



July 2014



July 2020

Survey Photo 51: T 10.0 Looking West



July 2014



July 2020

Survey Photo 52: T 10.0 Looking East



August 2015



July 2020

Survey Photo 53: T 11.0 Looking North

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



July 2014



July 2020

Survey Photo 54: T 11.0 Looking West



July 2014



July 2020

Survey Photo 55: T 11.0 Looking East



August 2015



July 2020

Survey Photo 56: T 12.0 Looking North

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



July 2014



July 2020

Survey Photo 57: T 12.0 Looking West



July 2014



July 2020

Survey Photo 58: T 12.0 Looking East



July 2014



July 2020

Survey Photo 59: T 13.0 Looking North

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



July 2014



July 2020

Survey Photo 60: T 13.0 Looking West



July 2014



July 2020

Survey Photo 61: T 13.0 Looking East



July 2014



July 2020

Survey Photo 62: T 14.0 Looking West July

SURVEY PHOTO LOG

SITE NAME: Foy's Bend

MONITORING YEAR: 2014-2016 and 2020



July 2014



July 2020

Survey Photo 63: T 14.0 Looking East

APPENDIX C

2013 – 2020 COMPREHENSIVE PLANT SPECIES LIST

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

Table C-1. Comprehensive list of plant species observed at the Foy's Bend Fisheries Conservation Area Stream Mitigation Site from 2013 through 2020.

Scientific Name	Common Name	WMVC Indicator Status*
<i>Achillea millefolium</i>	Common Yarrow	FACU
<i>Agastache urticifolia</i>	Nettle-Leaf Giant-Hyssop	FACU
<i>Agropyron</i> sp.	Wheatgrass	N/A
<i>Agrostis gigantea</i>	Black Bent	FAC
<i>Agrostis stolonifera</i>	Spreading Bent	FAC
<i>Alnus incana</i>	Speckled Alder	FACW
<i>Alopecurus aequalis</i>	Short-Awn Meadow-Foxtail	OBL
<i>Alopecurus arundinaceus</i>	Creeping Meadow-Foxtail	FAC
<i>Alopecurus pratensis</i>	Field Meadow-Foxtail	FAC
<i>Alyssum alyssoides</i>	Pale Alyssum	UPL
<i>Apocynum cannabinum</i>	Indian-Hemp	FAC
<i>Arctium lappa</i>	Greater Burdock	UPL
<i>Arctium minus</i>	Lesser Burdock	UPL
<i>Asclepias</i> sp.	Milkweed	N/A
<i>Asparagus officinalis</i>	Asparagus	FACU
<i>Asperugo procumbens</i>	German-Madwort	UPL
<i>Aster</i> sp. (white rays)	Aster	N/A
<i>Aster</i> sp. (purple rays)	Aster	N/A
<i>Bassia scoparia</i>	Mexican-Fireweed	FAC
<i>Brassica juncea</i>	Chinese Mustard	UPL
<i>Bromus inermis</i>	Smooth Brome	UPL
<i>Calamagrostis canadensis</i>	Bluejoint	FACW
<i>Carduus acanthoides</i>	Spiny Plumeless-thistle	UPL
<i>Carduus nutans</i>	Nodding Plumeless-Thistle	UPL
<i>Carex aquatilis</i>	Leafy Tussock Sedge	OBL
<i>Carex bebbii</i>	Bebb's Sedge	OBL
<i>Carex nebrascensis</i>	Nebraska Sedge	OBL
<i>Carex pellita</i>	Woolly Sedge	OBL
<i>Carex</i> sp.	Sedge	N/A
<i>Carex stipata</i>	Stalk-Grain Sedge	OBL
<i>Carex utriculata</i>	Northwest Territory Sedge	OBL
<i>Carex vesicaria</i>	Lesser Bladder Sedge	OBL
<i>Carum carvi</i>	Caraway	FACU
<i>Chamaenerion angustifolium</i>	Narrow-Leaf Fireweed	FACU
<i>Chenopodium album</i>	Lamb's-Quarters	FACU
<i>Chenopodium leptophyllum</i>	Narrow-Leaf Goosefoot	FACU
<i>Chenopodium rubrum</i>	Red Goosefoot	FACW

Scientific Name	Common Name	WMVC Indicator Status*
<i>Cirsium arvense</i>	Canadian Thistle	FAC
<i>Cirsium vulgare</i>	Bull Thistle	FACU
<i>Clematis ligusticifolia</i>	Deciduous Traveler's-Joy	FAC
<i>Convolvulus arvensis</i>	Field Bindweed	UPL
<i>Coreopsis tinctoria</i>	Golden Tickseed	FACU
<i>Cornus alba</i>	Red Osier	FACW
<i>Crataegus douglasii</i>	Black Hawthorn	FAC
<i>Cynoglossum officinale</i>	Gypsy-Flower	FACU
<i>Dactylis glomerata</i>	Orchard Grass	FACU
<i>Descurainia sophia</i>	Herb Sophia	UPL
<i>Elaeagnus commutata</i>	American Silver-Berry	FAC
<i>Eleocharis palustris</i>	Common Spike-Rush	OBL
<i>Elymus canadensis</i>	Nodding Wild Rye	FAC
<i>Elymus hispidus</i>	Intermediate Wheatgrass	UPL
<i>Elymus lanceolatus</i>	Streamside Wild Rye	FACU
<i>Elymus repens</i>	Creeping Wild Rye	FAC
<i>Elymus trachycaulus</i>	Slender Wild Rye	FAC
<i>Epilobium ciliatum</i>	Fringed Willowherb	FACW
<i>Equisetum arvense</i>	Field Horsetail	FAC
<i>Equisetum hyemale</i>	Tall Scouring-Rush	FACW
<i>Euphorbia esula</i>	Leafy Spurge	UPL
<i>Galium aparine</i>	Sticky-Willy	FACU
<i>Geum macrophyllum</i>	Large-Leaf Avens	FAC
<i>Glyceria grandis</i>	American Manna Grass	OBL
<i>Heracleum maximum</i>	American Cow-Parsnip	FAC
<i>Hordeum jubatum</i>	Fox-Tail Barley	FAC
<i>Juncus balticus</i>	Baltic Rush	FACW
<i>Juncus bufonius</i>	Toad Rush	FACW
<i>Juncus compressus</i>	Round-Fruit Rush	OBL
<i>Juncus effusus</i>	Lamp Rush	FACW
<i>Juncus ensifolius</i>	Dagger-Leaf Rush	FACW
<i>Juncus nodosus</i>	Knotted Rush	OBL
<i>Juncus sp.</i>	Rush	N/A
<i>Juncus tenuis</i>	Lesser Poverty Rush	FAC
<i>Lactuca serriola</i>	Prickly Lettuce	FACU
<i>Lemna minor</i>	Common Duckweed	OBL
<i>Leucanthemum vulgare</i>	Ox-Eye Daisy	FACU
<i>Linaria vulgaris</i>	Butter-and-eggs	UPL
<i>Lonicera tatarica</i>	Twinsisters	FACU

Scientific Name	Common Name	WMVC Indicator Status*
<i>Maianthemum stellatum</i>	Starry False Solomon's-Seal	FAC
<i>Medicago lupulina</i>	Black Medick	FACU
<i>Medicago sativa</i>	Alfalfa	UPL
<i>Melilotus albus</i>	White Sweetclover	UPL
<i>Melilotus officinalis</i>	Yellow Sweet-Clover	FACU
<i>Mentha arvensis</i>	American Wild Mint	FACW
<i>Nepeta cataria</i>	Catnip	FACU
<i>Pascopyrum smithii</i>	Western-Wheat Grass	FACU
<i>Persicaria amphibia</i>	Water Smartweed	OBL
<i>Persicaria sp.</i>	Smartweed	N/A
<i>Phalaris arundinacea</i>	Reed Canary Grass	FACW
<i>Phleum pratense</i>	Common Timothy	FAC
<i>Plantago lanceolata</i>	English Plantain	FACU
<i>Plantago major</i>	Great Plantain	FAC
<i>Poa palustris</i>	Fowl Blue Grass	FAC
<i>Poa pratensis</i>	Kentucky Blue Grass	FAC
<i>Polygonum aviculare</i>	Yard Knotweed	FAC
<i>Populus angustifolia</i>	Narrow-Leaf Cottonwood	FACW
<i>Populus balsamifera</i>	Balsam Poplar	FAC
<i>Populus tremuloides</i>	Quaking Aspen	FACU
<i>Potentilla anserina</i>	Silverweed	OBL
<i>Potentilla recta</i>	Sulphur Cinquefoil	N/A
<i>Prunus virginiana</i>	Choke Cherry	FACU
<i>Ribes inerme</i>	White-Stem Gooseberry	FAC
<i>Ribes sp.</i>	Currant	N/A
<i>Rosa woodsii</i>	Woods' Rose	FACU
<i>Rumex crispus</i>	Curly Dock	FAC
<i>Rumex fueginus</i>	Tierra del Fuego Dock	FACW
<i>Rumex salicifolius</i>	Willow Dock	FACW
<i>Sagittaria cuneata</i>	Arum-Leaf Arrowhead	OBL
<i>Salix bebbiana</i>	Gray Willow	FACW
<i>Salix exigua</i>	Narrow-Leaf Willow	FACW
<i>Salix sp.</i>	Willow	N/A
<i>Schedonorus pratensis</i>	Meadow False Rye Grass	FACU
<i>Schoenoplectus acutus</i>	Hard-Stem Club-Rush	OBL
<i>Scirpus microcarpus</i>	Red-Tinge Bulrush	OBL
<i>Scirpus sp.</i>	Bulrush	N/A
<i>Shepherdia argentea</i>	Silver Buffalo-Berry	FACU
<i>Silene vulgaris</i>	Maiden's-tears	UPL
<i>Solanum dulcamara</i>	Climbing Nightshade	FAC

Scientific Name	Common Name	WMVC Indicator Status*
<i>Solidago canadensis</i>	Canadian Goldenrod	FACU
<i>Sonchus arvensis</i>	Field Sow-Thistle	FACU
<i>Sporobolus airoides</i>	Alkali-Sacaton	FAC
<i>Stachys pilosa</i>	Hairy Hedge-nettle	FACW
<i>Symphoricarpos albus</i>	Common Snowberry	FACU
<i>Symphyotrichum ascendens</i>	Western American-Aster	FACU
<i>Symphyotrichum falcatum</i>	Rough White Prairie American-Aster	FACU
<i>Symphyotrichum laeve</i>	Smooth Blue American-Aster	FACU
<i>Symphyotrichum lanceolatum</i>	White Panicked American-Aster	OBL
<i>Tanacetum vulgare</i>	Common Tansy	FACU
<i>Taraxacum officinale</i>	Common Dandelion	FACU
<i>Thlaspi arvense</i>	Field Pennycress	UPL
<i>Tragopogon dubius</i>	Meadow Goat's-beard	UPL
<i>Trifolium pratense</i>	Red Clover	FACU
<i>Trifolium repens</i>	White Clover	FAC
<i>Typha angustifolia</i>	Narrow-Leaf Cat-Tail	OBL
<i>Typha latifolia</i>	Broad-Leaf Cat-Tail	OBL
<i>Verbascum thapsus</i>	Great Mullein	FACU

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

New species identified in 2020 are **bolded**

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

APPENDIX D

2020 STREAM BANK VEGETATION COMPOSITION

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

Table D-1. Plant species and their associated cover classes along the stream banks of the Foy's Bend Fisheries Conservation Area stream mitigation site in 2020. Classification Values and Percent Cover Classes: 0 = <1, 1 = 1-5, 2 = 6-10, 3 = 11-20, 4 = 21-50, 5 = >50

Streambank Species	WMVC Indicator Status*
<i>Agrostis stolonifera</i>	FAC
<i>Alopecurus arundinaceus</i>	FAC
<i>Apocynum cannabinum</i>	FAC
<i>Arctium minus</i>	UPL
<i>Brassica juncea</i>	UPL
<i>Bromus inermis</i>	UPL
<i>Calamagrostis canadensis</i>	FACW
<i>Carex bebbii</i>	OBL
<i>Carex nebrascensis</i>	OBL
<i>Carex pellita</i>	OBL
<i>Carex stipata</i>	OBL
<i>Carex utriculata</i>	OBL
<i>Carex vesicaria</i>	OBL
<i>Cirsium arvense</i>	FAC
<i>Cirsium vulgare</i>	FACU
<i>Cornus alba</i>	FACW
<i>Crataegus douglasii</i>	FAC
<i>Cynoglossum officinale</i>	FACU
<i>Elaeagnus commutata</i>	FAC
<i>Eleocharis palustris</i>	OBL
<i>Elymus lanceolatus</i>	FACU
<i>Elymus repens</i>	FAC
<i>Epilobium ciliatum</i>	FACW
<i>Equisetum arvense</i>	FAC
<i>Juncus balticus</i>	FACW
<i>Juncus ensifolius</i>	FACW
<i>Juncus effusus</i>	FACW
<i>Juncus nodosus</i>	OBL
<i>Juncus tenuis</i>	FAC
<i>Lactuca serriola</i>	FACU
<i>Leucanthemum vulgare</i>	FACU
<i>Linaria vulgaris</i>	UPL
<i>Mentha arvensis</i>	FACW
<i>Nepeta cataria</i>	FACU
<i>Phalaris arundinacea**</i>	FACW
<i>Poa palustris</i>	FAC

Streambank Species	WMVC Indicator Status*
<i>Poa pratensis</i>	FAC
<i>Populus balsamifera</i>	FAC
<i>Populus tremuloides</i>	FACU
<i>Rumex crispus</i>	FAC
<i>Salix bebbiana</i>	FACW
<i>Salix exigua</i>	FACW
<i>Schoenoplectus acutus</i>	OBL
<i>Scirpus microcarpus</i>	OBL
<i>Silene vulgaris</i>	UPL
<i>Solidago canadensis</i>	FACU
<i>Sonchus arvensis</i>	FACU
<i>Symphoricarpos albus</i>	FACU
<i>Symphyotrichum ascendens</i>	FACU
<i>Symphyotrichum lanceolatum</i>	OBL
<i>Taraxacum officinale</i>	FACU
<i>Trifolium pratense</i>	FACU
<i>Typha latifolia</i>	OBL
<i>Verbascum thapsus</i>	FACU

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

** Dominant species observed along Foy's Bend Fisheries Conservation Area stream banks

APPENDIX E
2020 NOXIOUS WEED SPECIES LIST
2020 NOXIOUS WEED SPECIES COVER

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

Table E-1. Montana State-listed noxious weed species observed in 2020 at the Foy's Bend Fisheries Conservation Area Stream Mitigation Site.

Category*	Scientific Name	Common Name
Priority 2B	<i>Centaurea stoebe</i>	Spotted Knapweed
	<i>Cirsium arvense</i>	Canadian Thistle
	<i>Convolvulus arvensis</i>	Field Bindweed
	<i>Cynoglossum officinale</i>	Houndstongue
	<i>Tanacetum vulgare</i>	Common Tansy
Priority 3 State Regulated	<i>Bromus tectorum</i>	Cheatgrass

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

Table E-2. Percent noxious weed coverage at Foy's Bend in 2020.

Exclosure #	Exclosure Acreage	% Cover of Exclosure by Noxious Weeds 2020	Acreage of Noxious Weeds
1	0.74	8	0.06
2	1.06	6	0.06
3	0.34	2	0.01
4	0.87	2	0.02
5	1.20	3	0.04
6	1.23	8	0.10
7	0.93	2	0.02
8	0.56	1	0.01
9	1.16	5	0.06
10	0.67	6	0.04
11	0.26	5	0.01
12	0.91	7	0.06
13	0.75	1	0.01
14	0.89	2	0.02
15	0.55	3	0.02
16	0.41	2	0.01
17	0.34	1	0.00
18	1.22	6	0.07
Stream Bank	0.31	3	0.01
Total Acreage	14.40		0.62
Total % Cover of Noxious Weeds at Foy's Bend:			4.28

APPENDIX F

WOODY PLANT SURVIVAL

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

Table F-1. Woody volunteer plant species establishment within exclosures at Foy's Bend from 2014-2020 and total percent cover of woody volunteers within exclosures at Foy's Bend in 2020.

Exclosure Number	Planted (Y/N)	% Cover by Volunteers							Alnus incana	Crataegus douglasii	Elaeagnus commutata	Populus balsamifera	Populus tremuloides	Prunus virginiana	Ribes inermis	Rosa woodsii	Salix bebbiana	Symphoricarpos albus
		2014	2015	2016	2017	2018	2019	2020										
1	Y	30%	40%	42%	35%	37%	36%	37%		X	X	X				X		X
2	Y	10%	50%	50%	45%	35%	36%	36%			X	X				X		X
3	Y	5%	3%	3%	3%	4%	3%	3%			X		X					
4	Y	0%	0%	0%	1%	1%	1%	1%			X							
5	Y	0%	0%	1%	1%	1%	1%	1%			X				X		X	
6	Y	20%	10%	11%	12%	12%	15%	15%			X		X	X				X
7	Y	1%	5%	5%	3%	2%	2%	2%					X					
8	N	1%	1%	0%	0%	0%	0%	0%										
9	Y	5%	1%	1%	1%	1%	1%	1%				X	X					
10	Y	25%	20%	18%	18%	20%	20%	21%		X	X		X					
11	N	15%	30%	30%	35%	37%	39%	40%				X	X					
12	N	20%	25%	25%	27%	27%	26%	27%					X				X	X
13	Y	0%	0%	0%	0%	0%	0%	0%										
14	Y	0%	0%	2%	1%	1%	1%	1%			X	X						X
15	Y	1%	0%	1%	1%	1%	1%	1%			X			X				X
16	Y	1%	0%	3%	2%	2%	1%	1%										X
17	Y	5%	5%	6%	5%	4%	5%	5%					X					X
18	N	5%	23%	25%	25%	25%	26%	27%				X	X	X				X
Total Acreage of Exclosures		Acreage of Woody Volunteers in 2020							Total % Cover of Woody Volunteers within Exclosures at Foy's Bend in 2020									
14.09		1.77							12.54%									

Table F-2. Total percent cover of woody volunteers and woody plantings within exclosures at Foy's Bend in 2020.

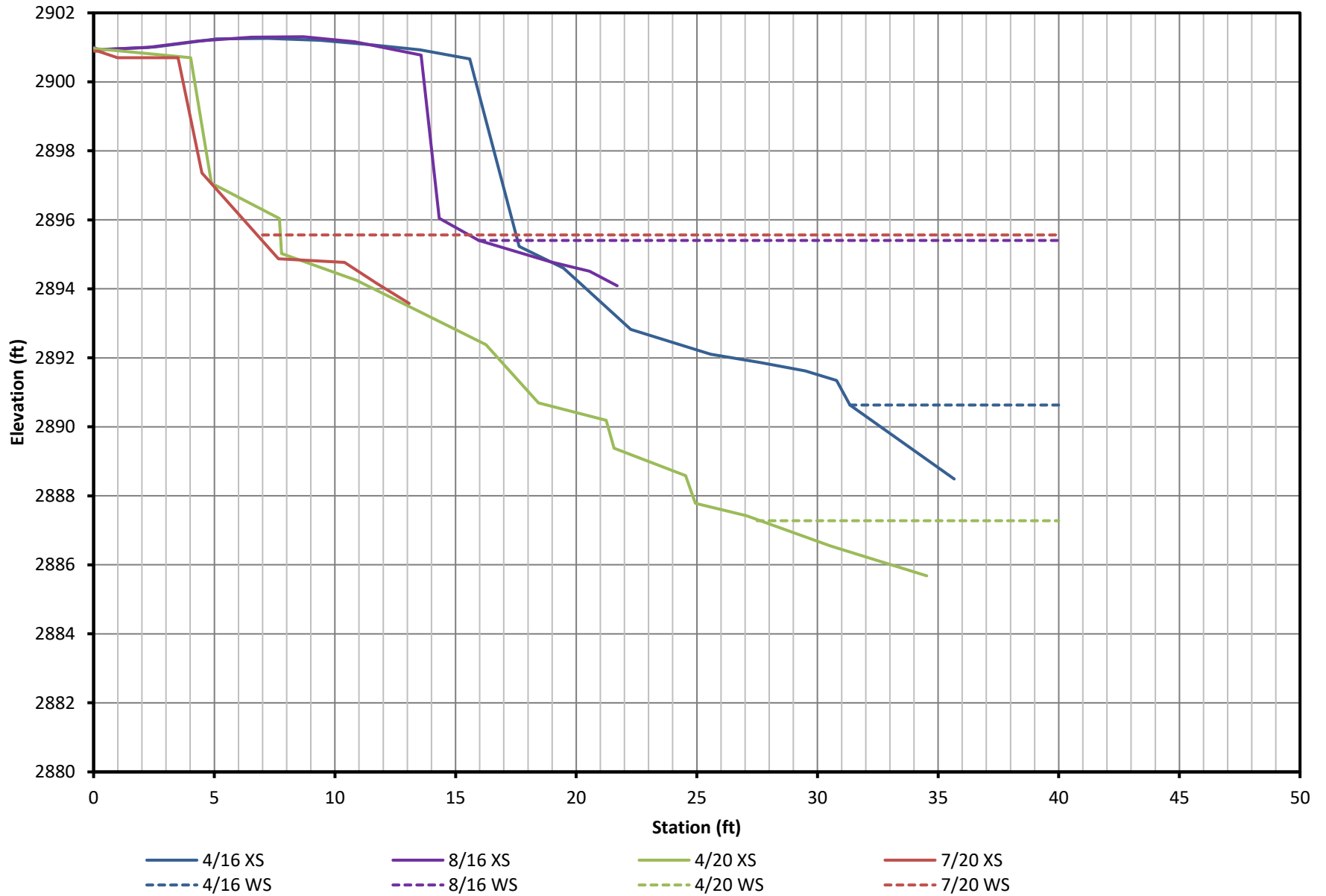
Exclosure	Planted (Y/N)	Woody Volunteer Cover (%)	Acreage of Woody Volunteers	Woody Planting Cover (%)	Acreage of Woody Plantings
		2020	2020	2020	2020
1	Y	37	0.27	2	0.01
2	Y	36	0.38	4	0.04
3	Y	3	0.01	2	0.01
4	Y	1	0.01	3	0.03
5	Y	1	0.01	3	0.04
6	Y	15	0.18	2	0.02
7	Y	3	0.03	2	0.02
8	N	0	0.00	N/A	N/A
9	Y	1	0.01	3	0.03
10	Y	21	0.14	5	0.03
11	N	40	0.10	N/A	N/A
12	N	27	0.25	N/A	N/A
13	Y	0	0.00	2	0.02
14	Y	1	0.01	2	0.02
15	Y	1	0.01	2	0.01
16	Y	1	0.00	2	0.01
17	Y	5	0.02	2	0.01
18	N	27	0.33	N/A	N/A
Total		12.54%	1.77	2.66%	0.30
Total Woody Cover (%) at Foys Bend:					15.20%

APPENDIX G

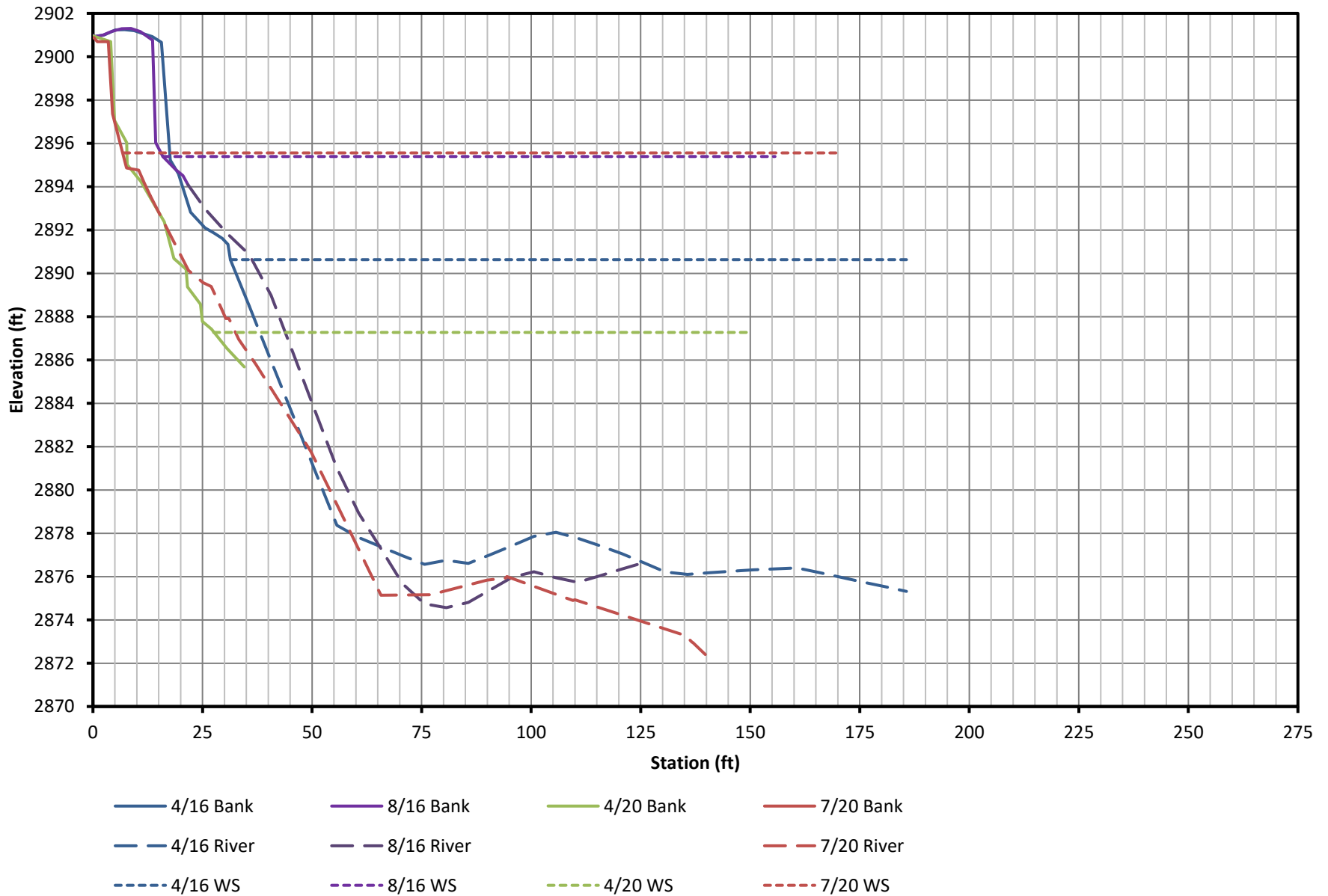
LONGITUDINAL PROFILE AND PERPENDICULAR TRANSECT PLOTS

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

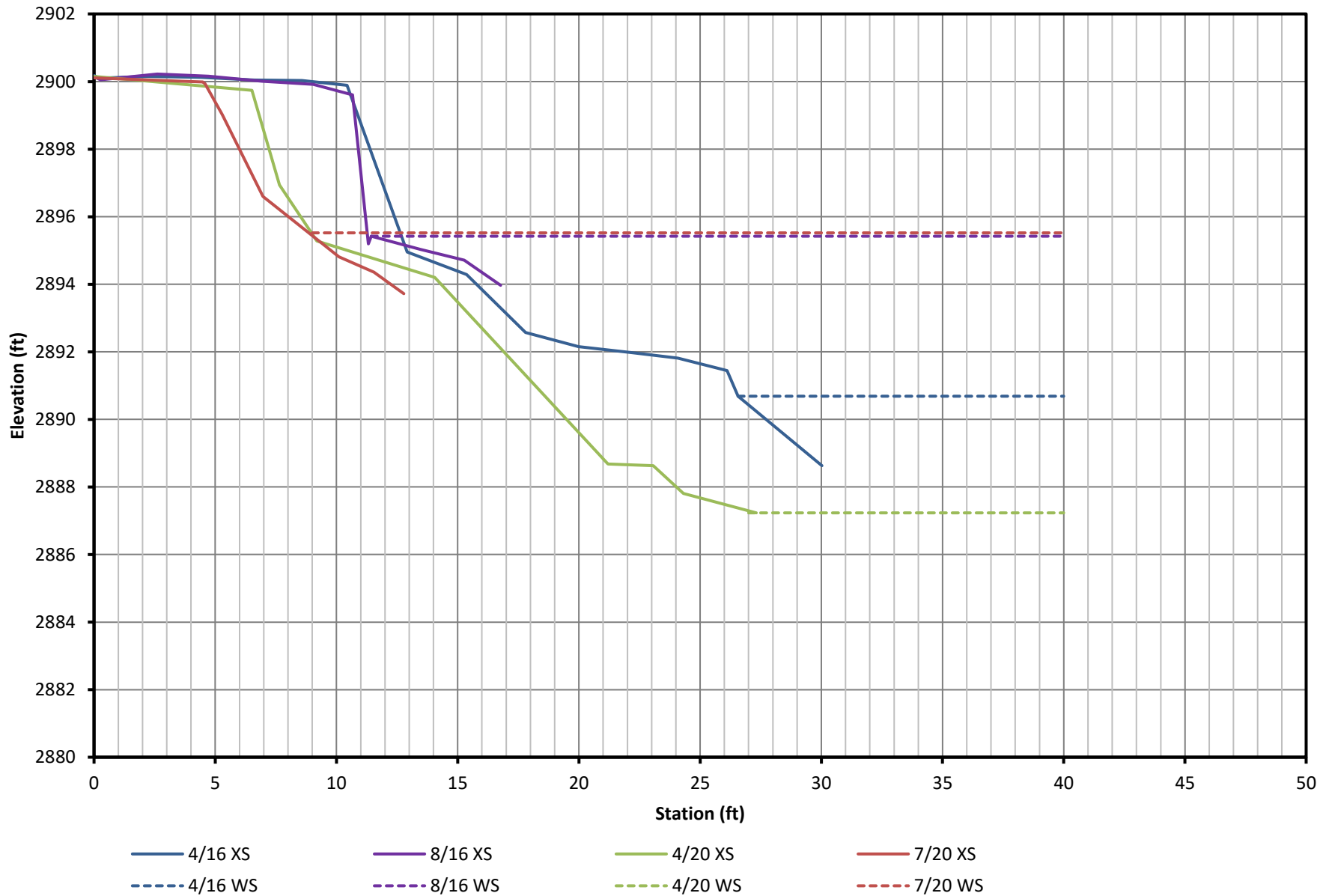
Foy's Bend Upper Bank Transect # -0.5



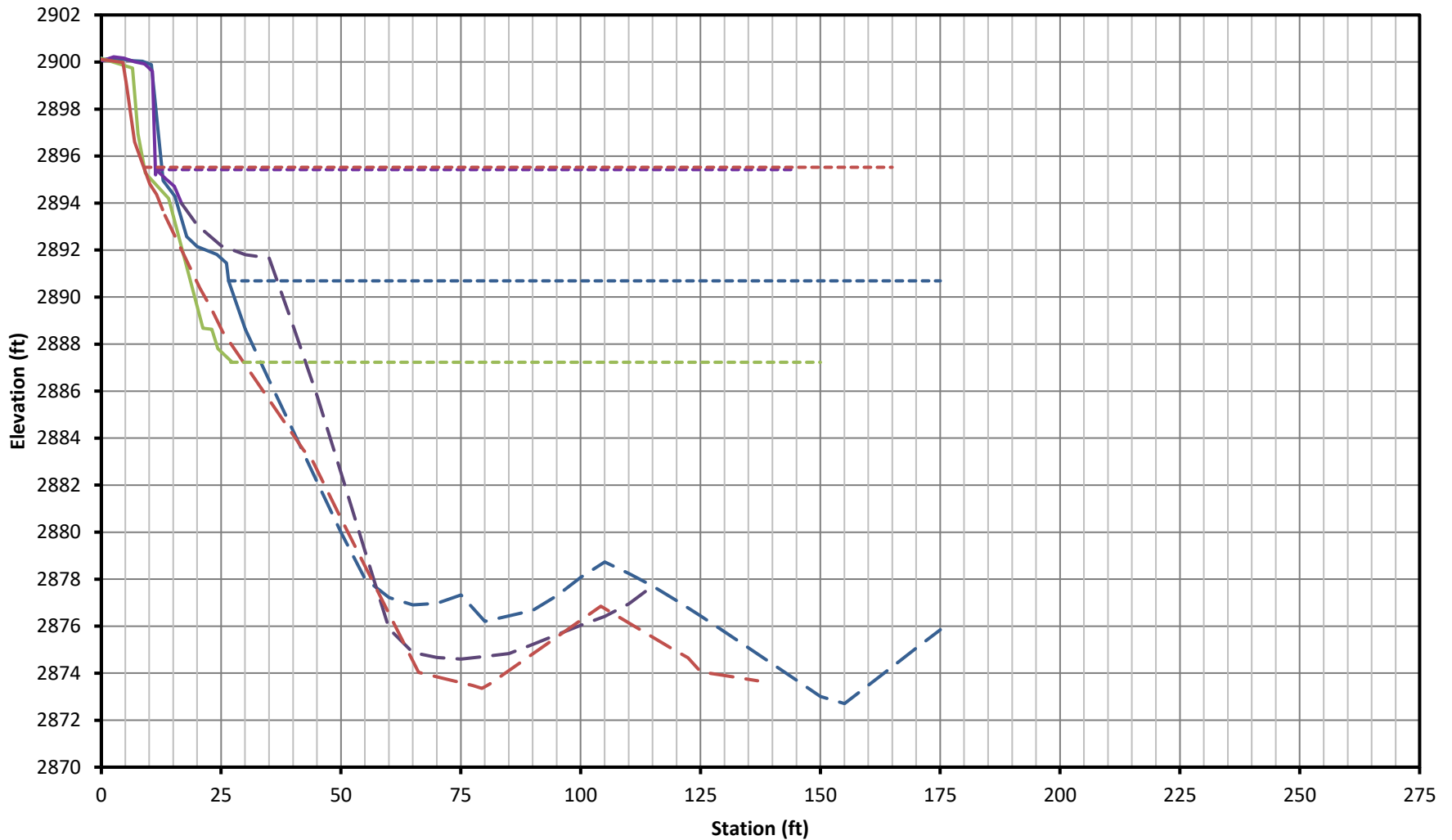
Foy's Bend Bank Transect # -0.5



Foy's Bend Upper Bank Transect #0

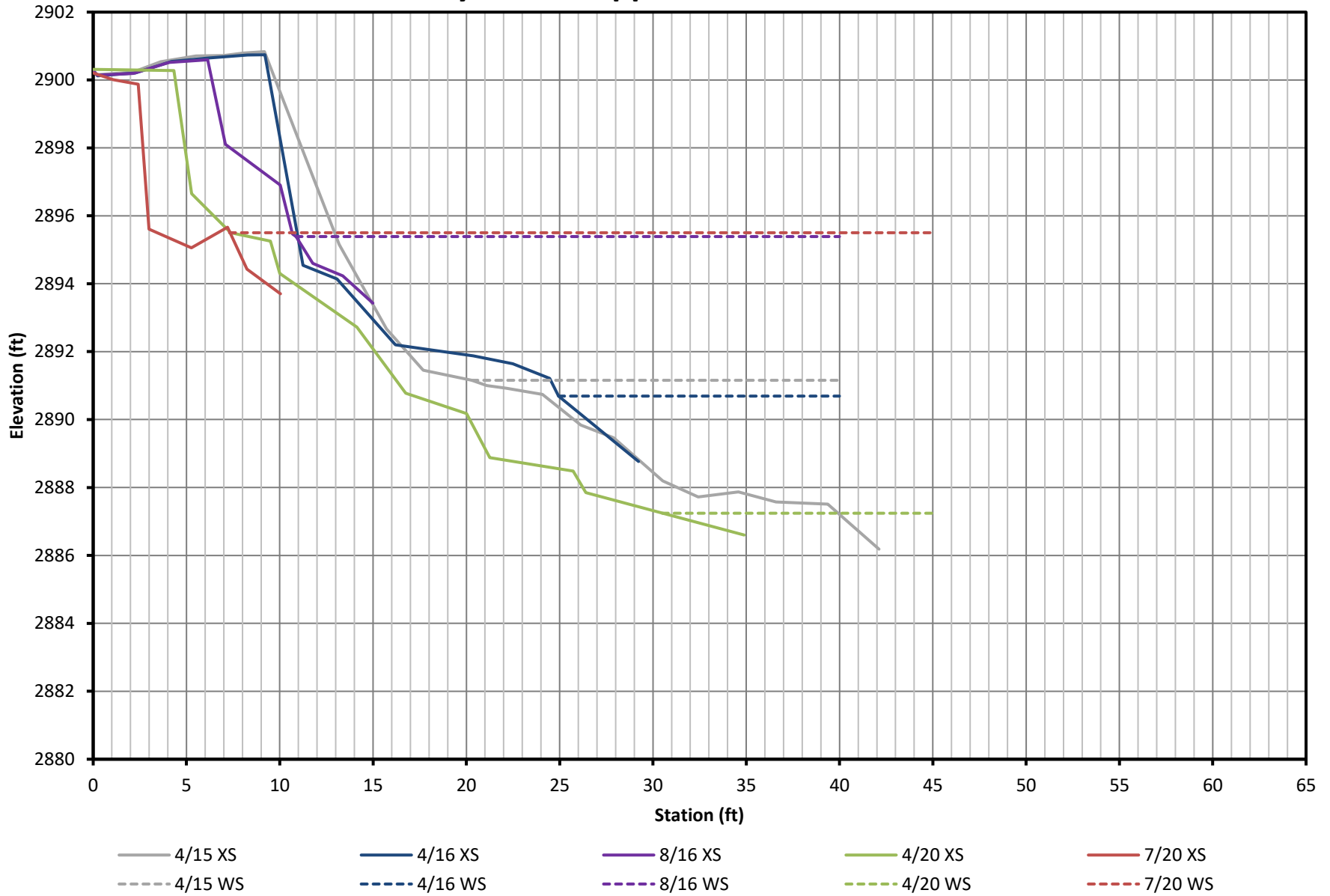


Foy's Bend Bank Transect #0

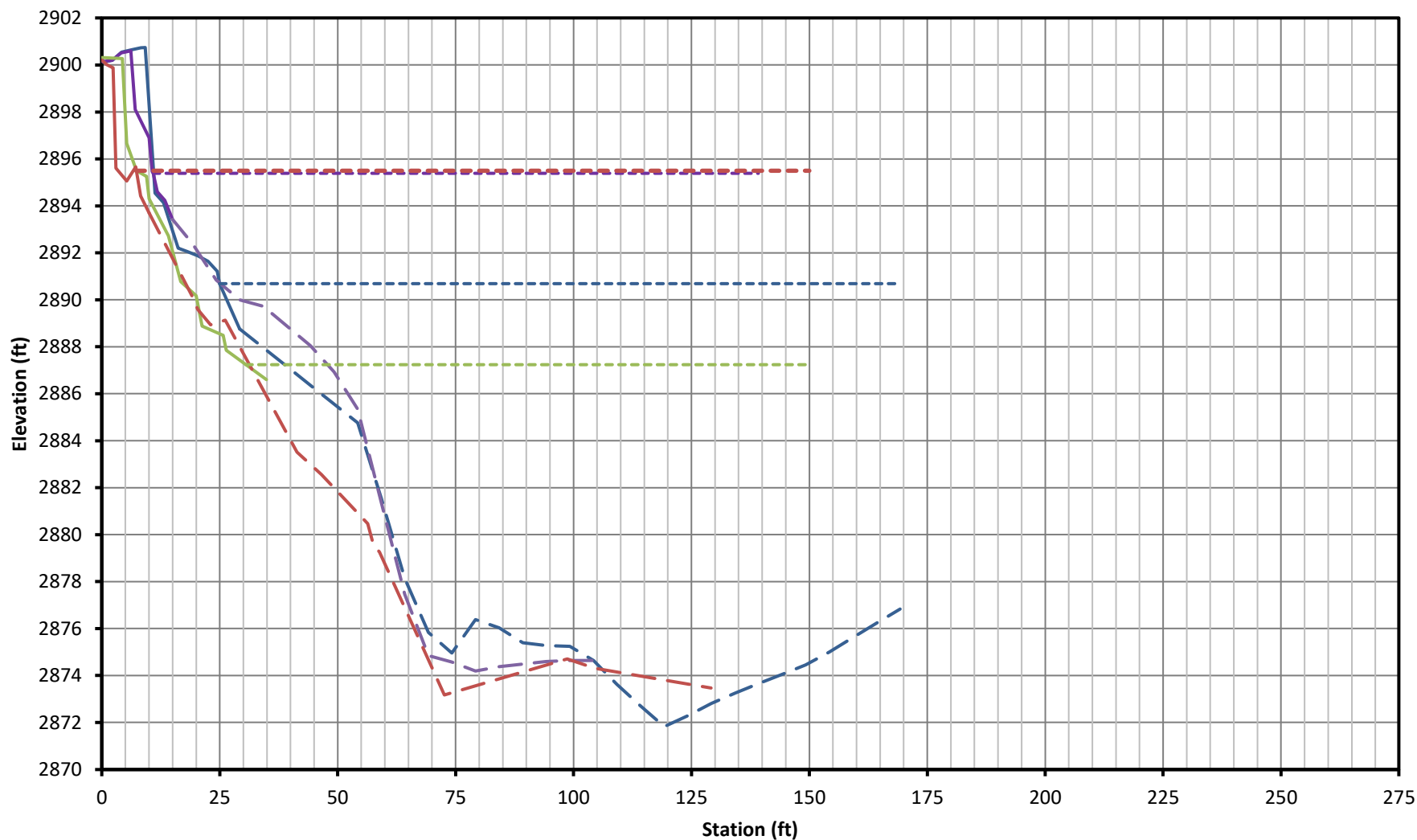


4/16 Bank 8/16 Bank 4/20 Bank 7/20 Bank
 4/16 River 8/16 River 7/20 River
 4/16 WS 8/16 WS 4/20 WS 7/20 WS

Foy's Bend Upper Bank Transect #0.5

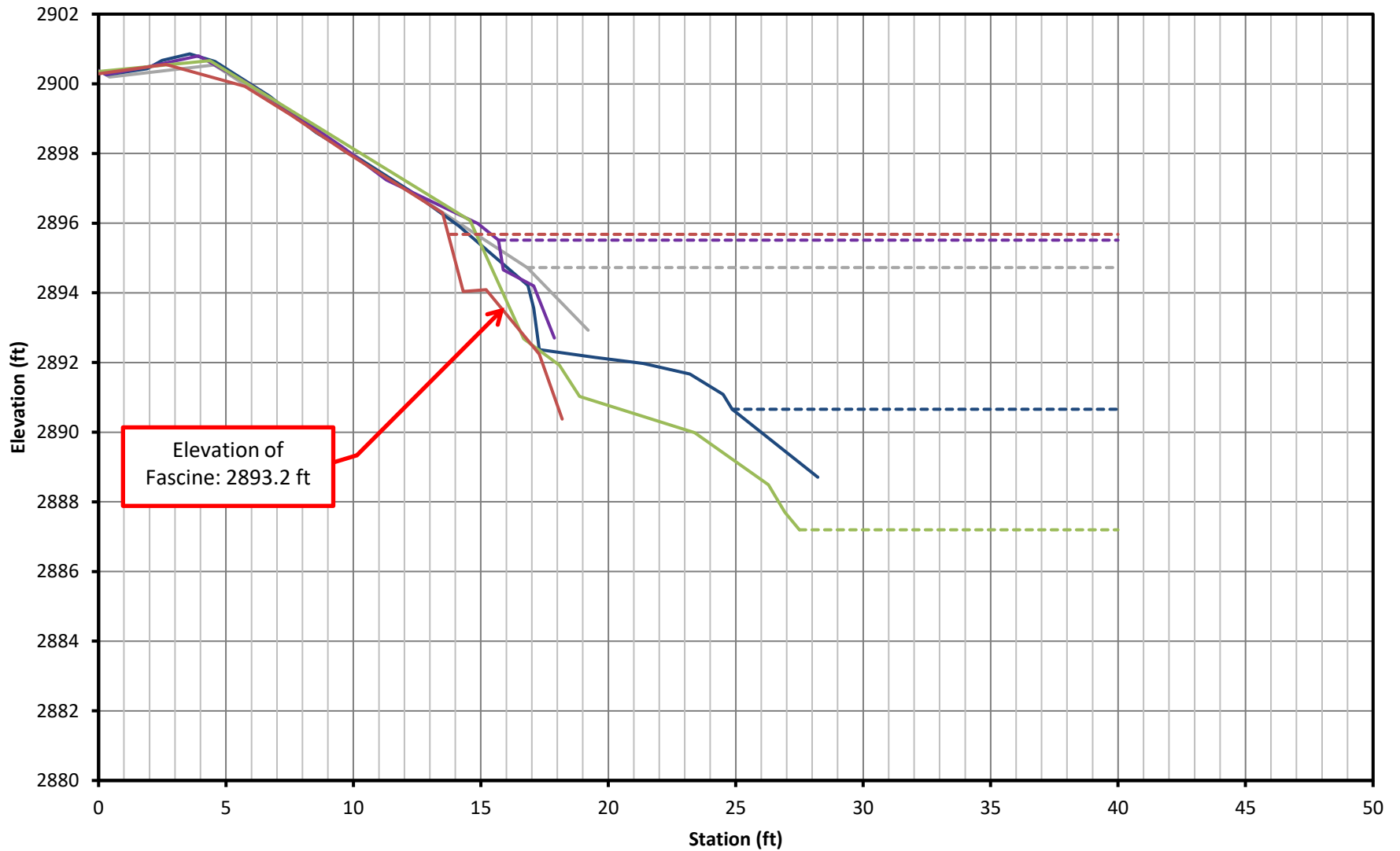


Foy's Bend Bank Transect #0.5



— 4/16 Bank	— 8/16 Bank	— 4/20 Bank	— 7/20 Bank
— 4/16 River	— 8/16 River		— 7/20 River
- - - 4/16 WS	- - - 8/16 WS	- - - 4/20 WS	- - - 7/20 WS

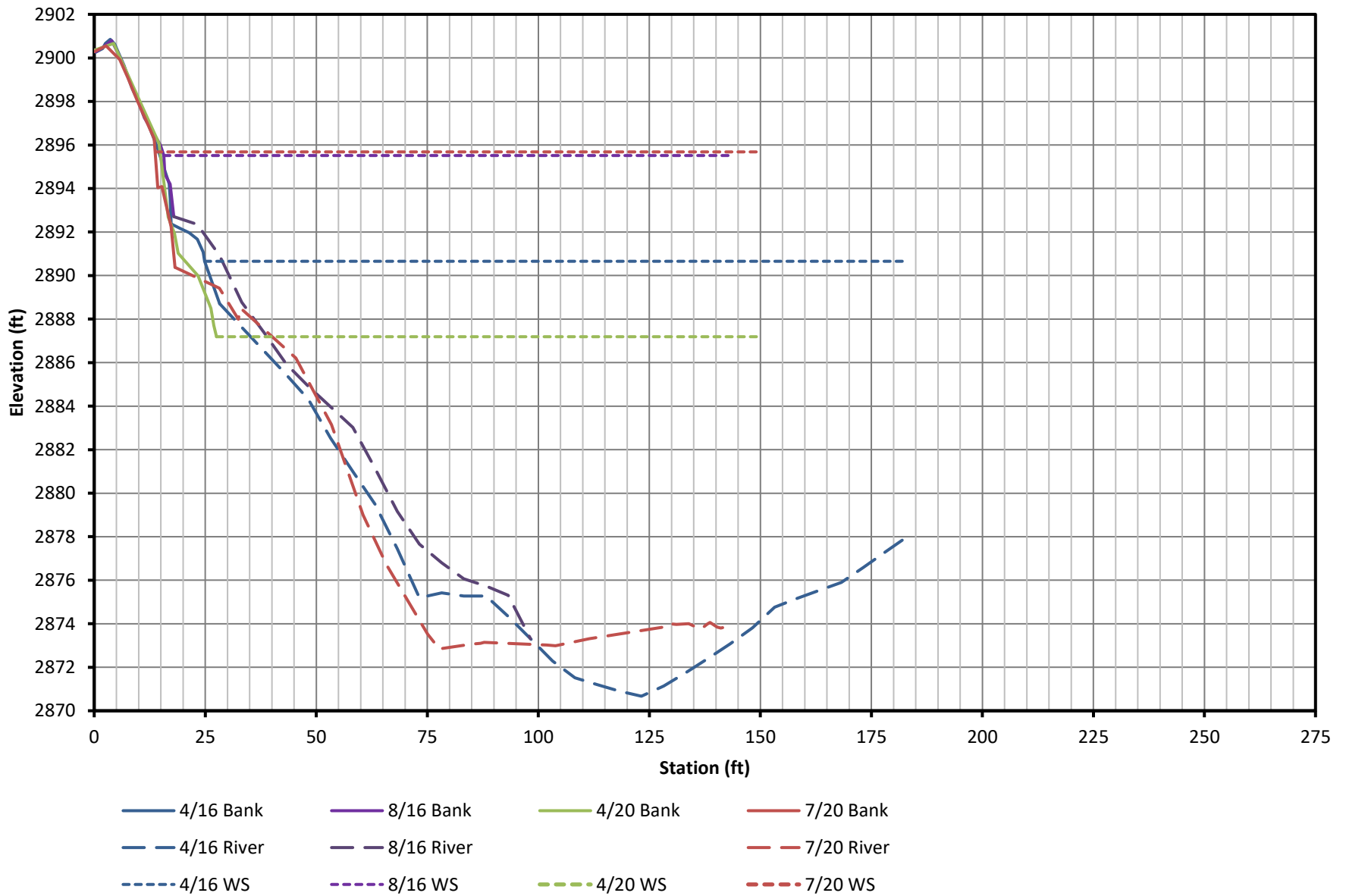
Foy's Bend Upper Bank Transect #1



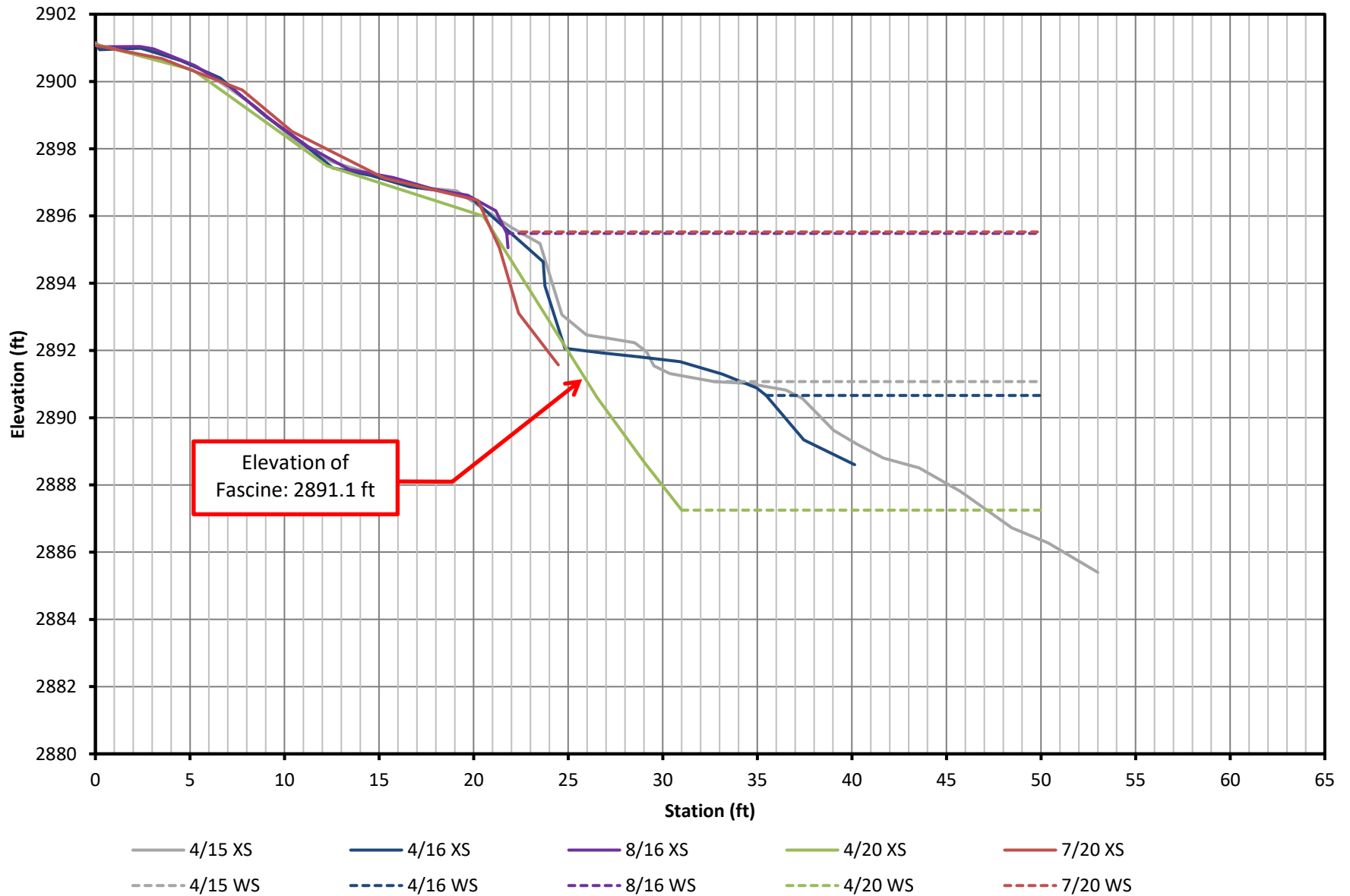
Elevation of
Fascine: 2893.2 ft

8/13 XS 4/16 XS 8/16 XS 4/20 XS 7/20 XS
8/13 WS 4/16 WS 8/16 WS 4/20 WS 7/20 WS

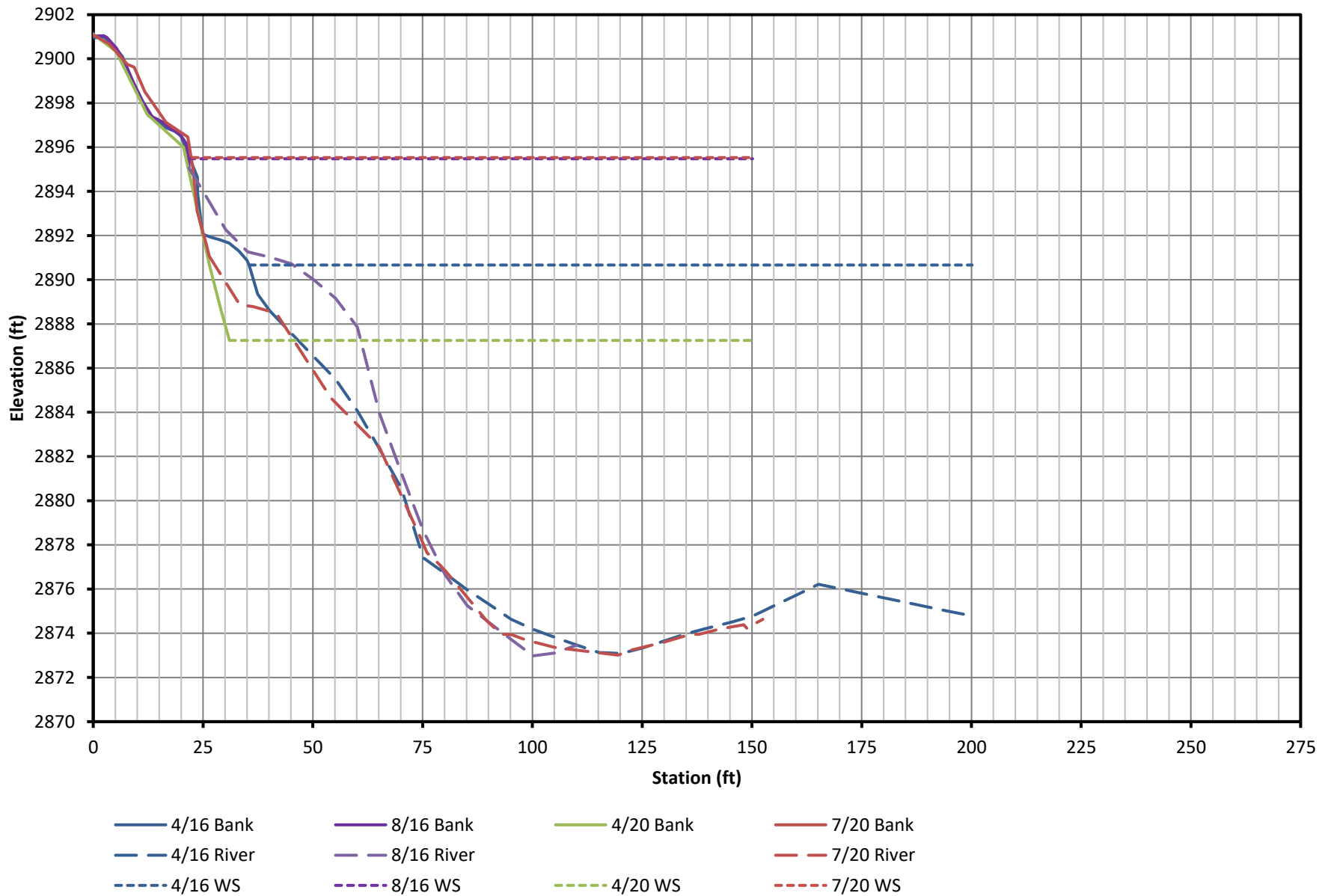
Foy's Bend Bank Transect #1



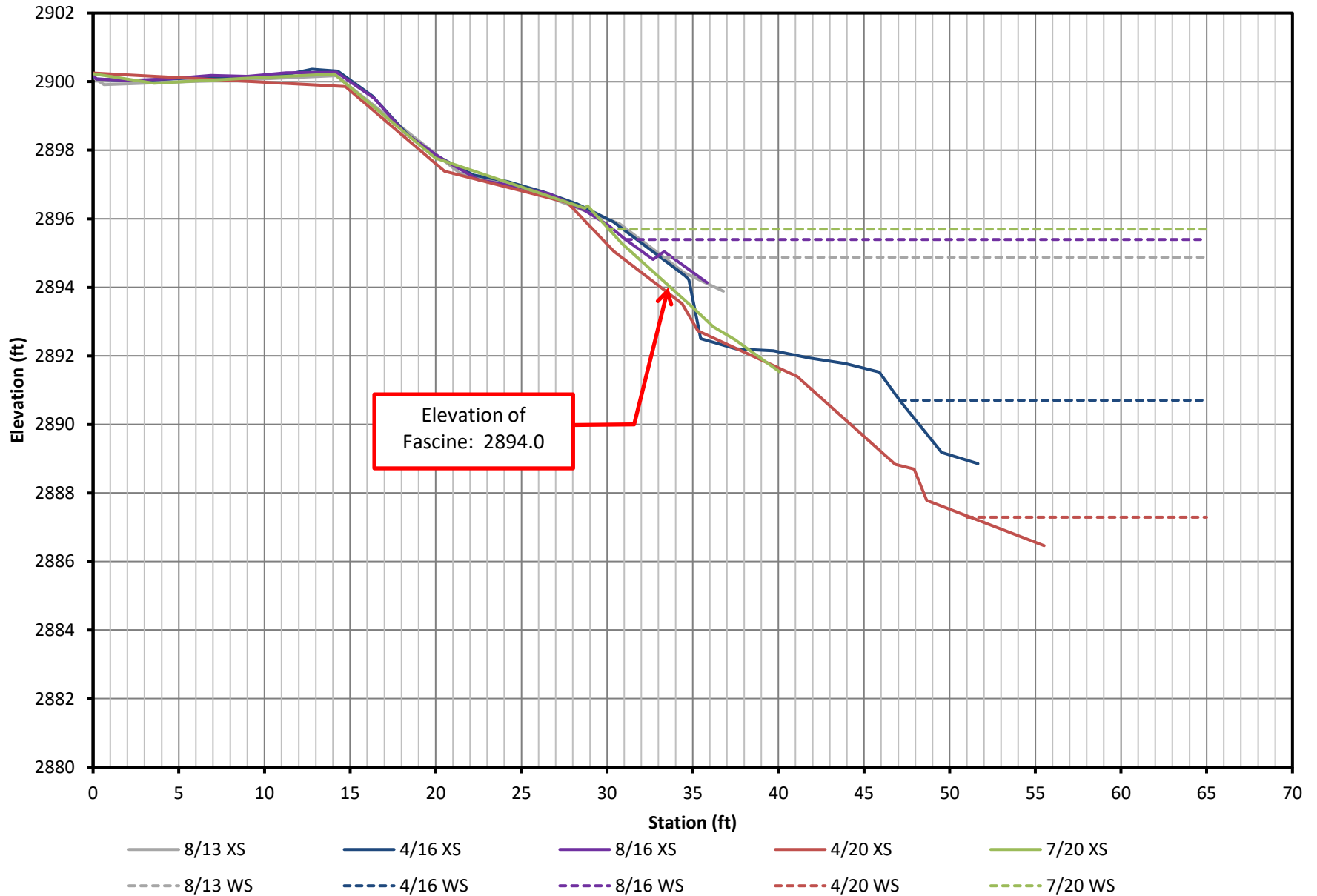
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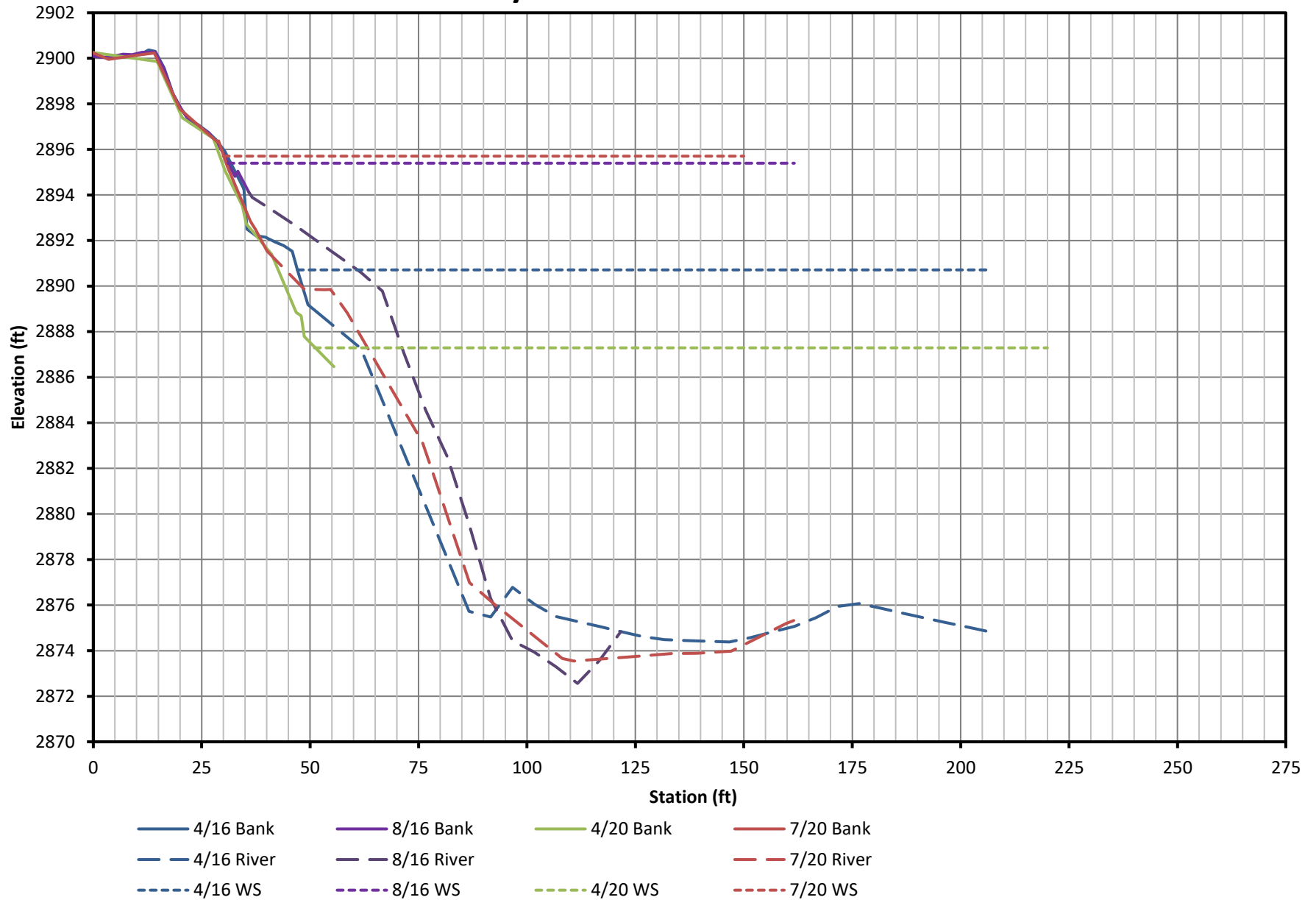
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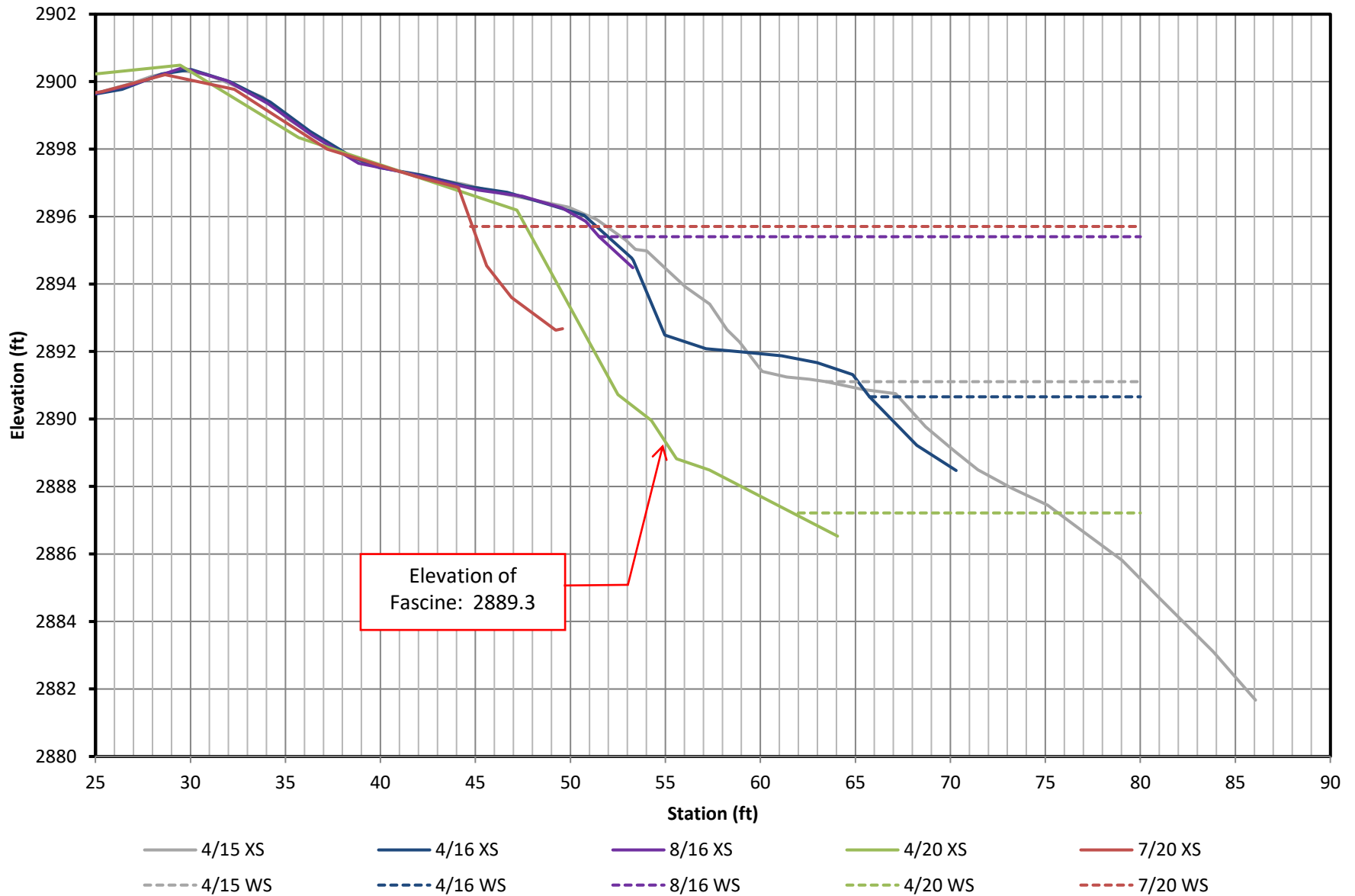
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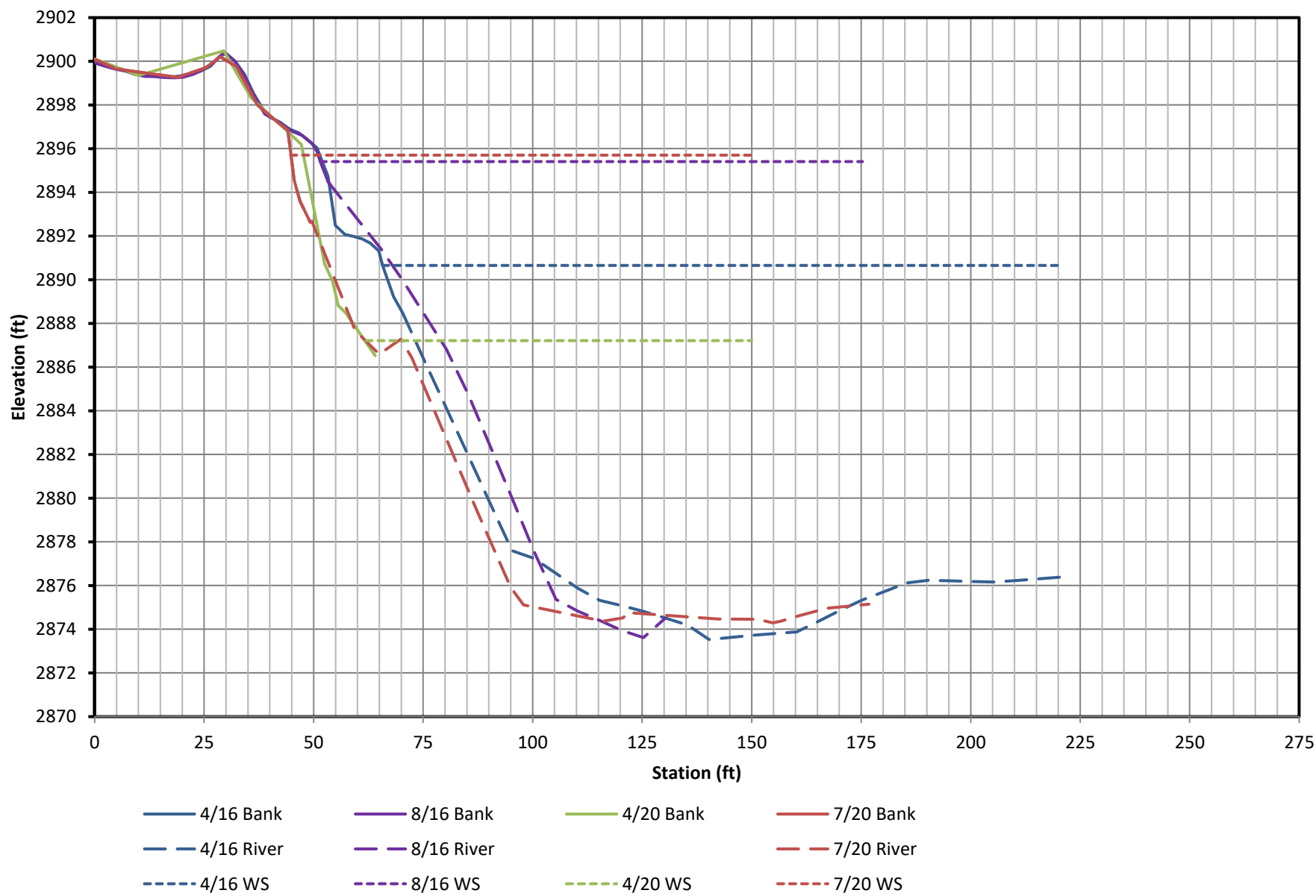
Foy's Bend Bank Transect #2



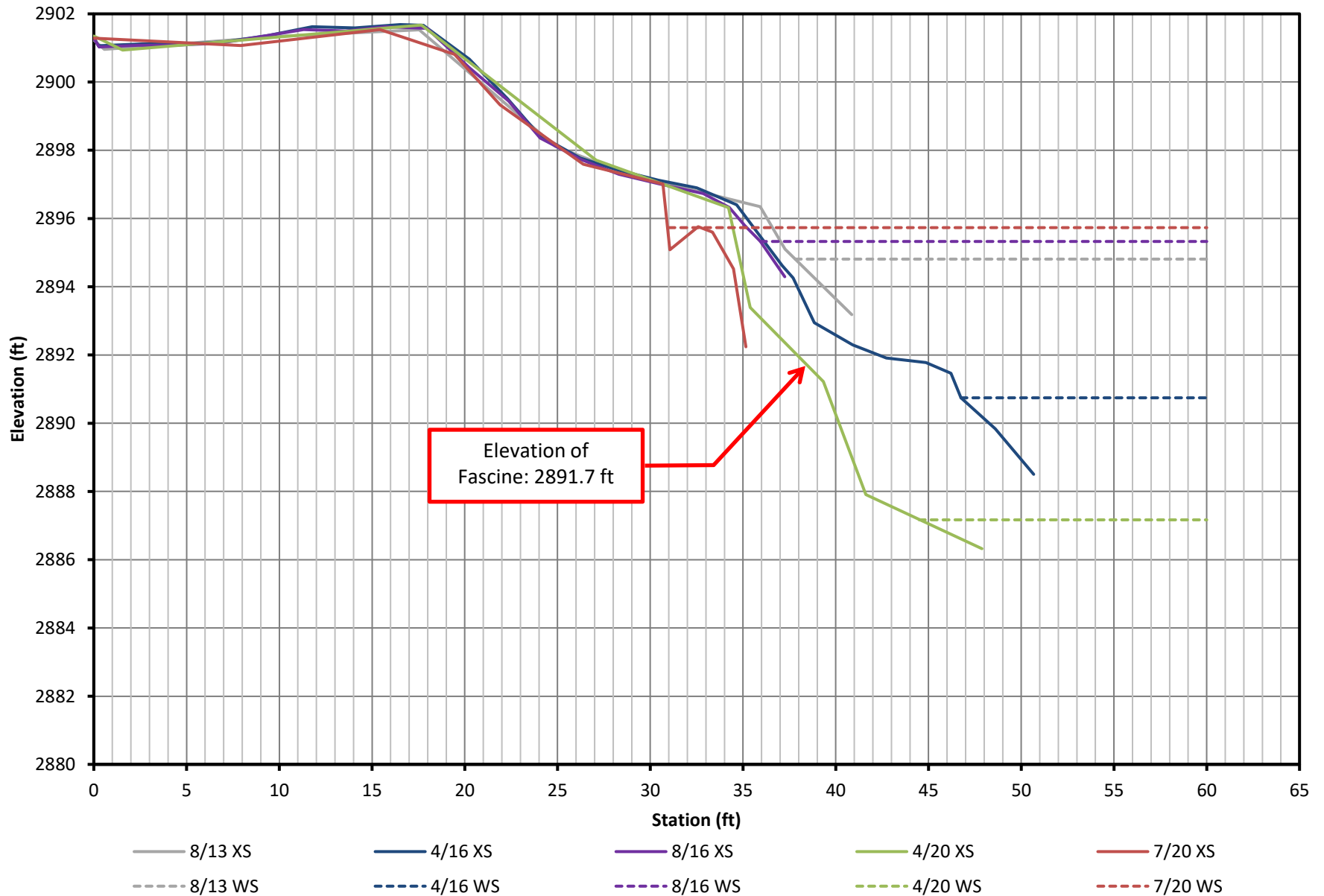
Foy's Bend Upper Bank Transect #2.5



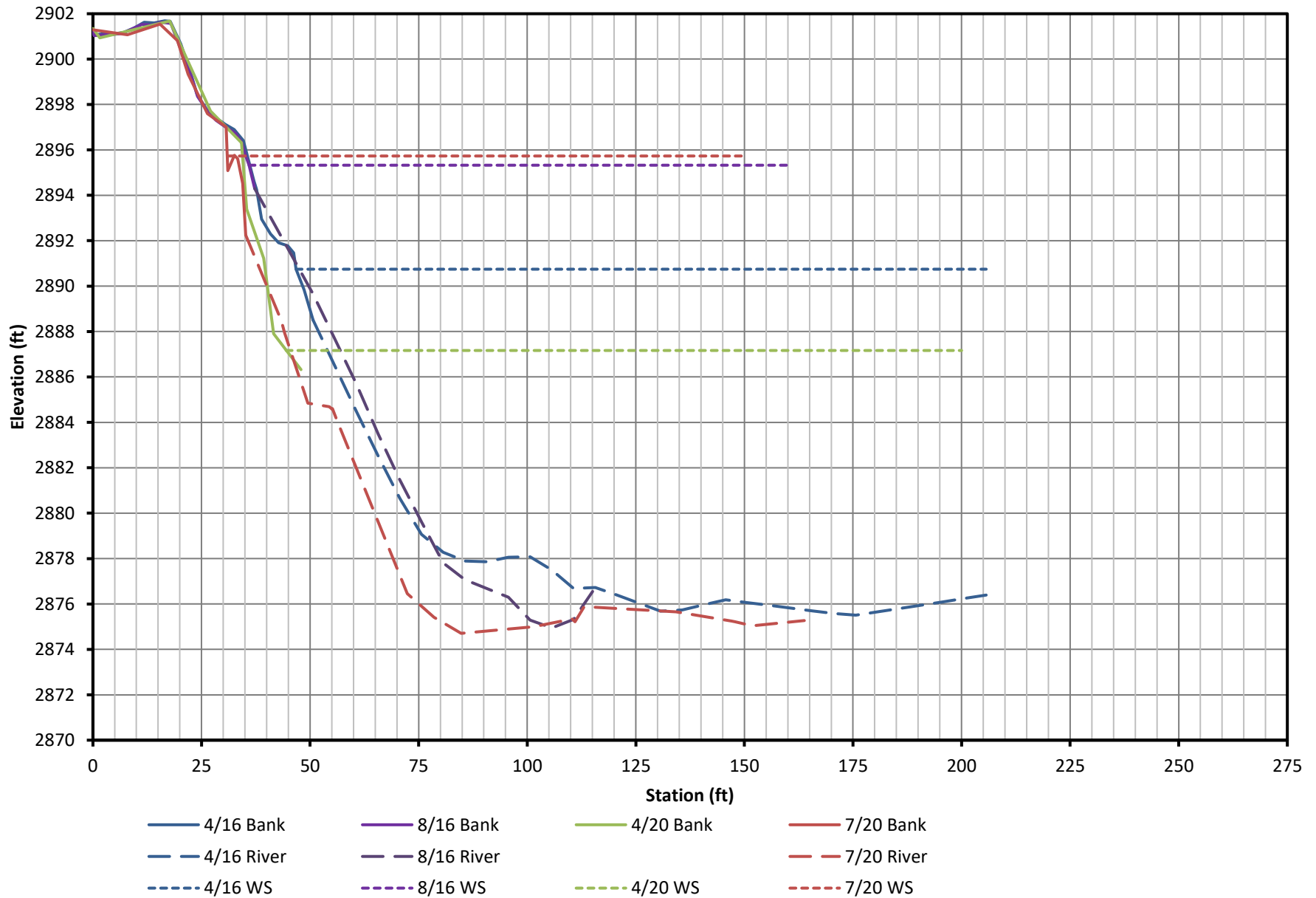
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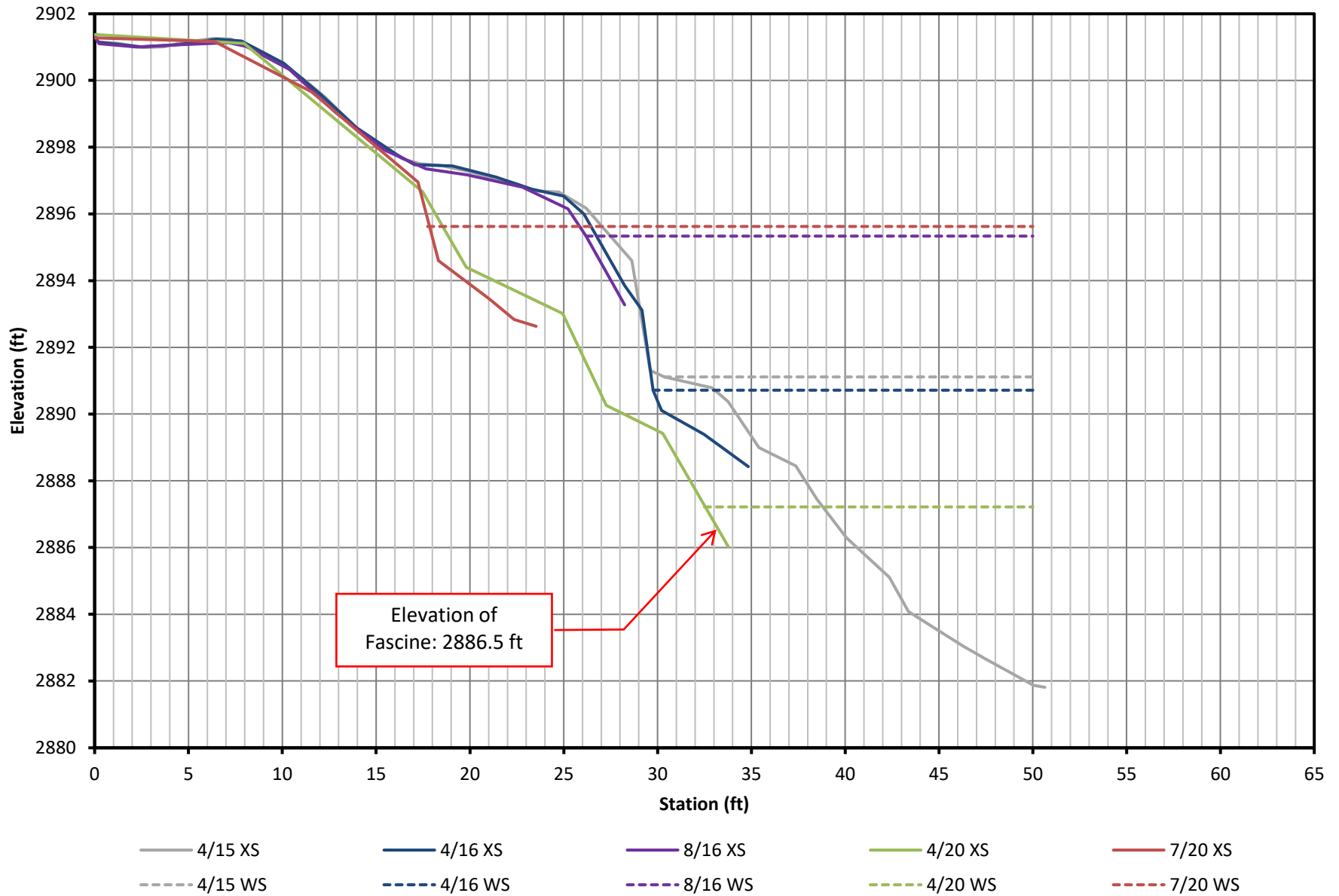
Foy's Bend Upper Bank Transect #3



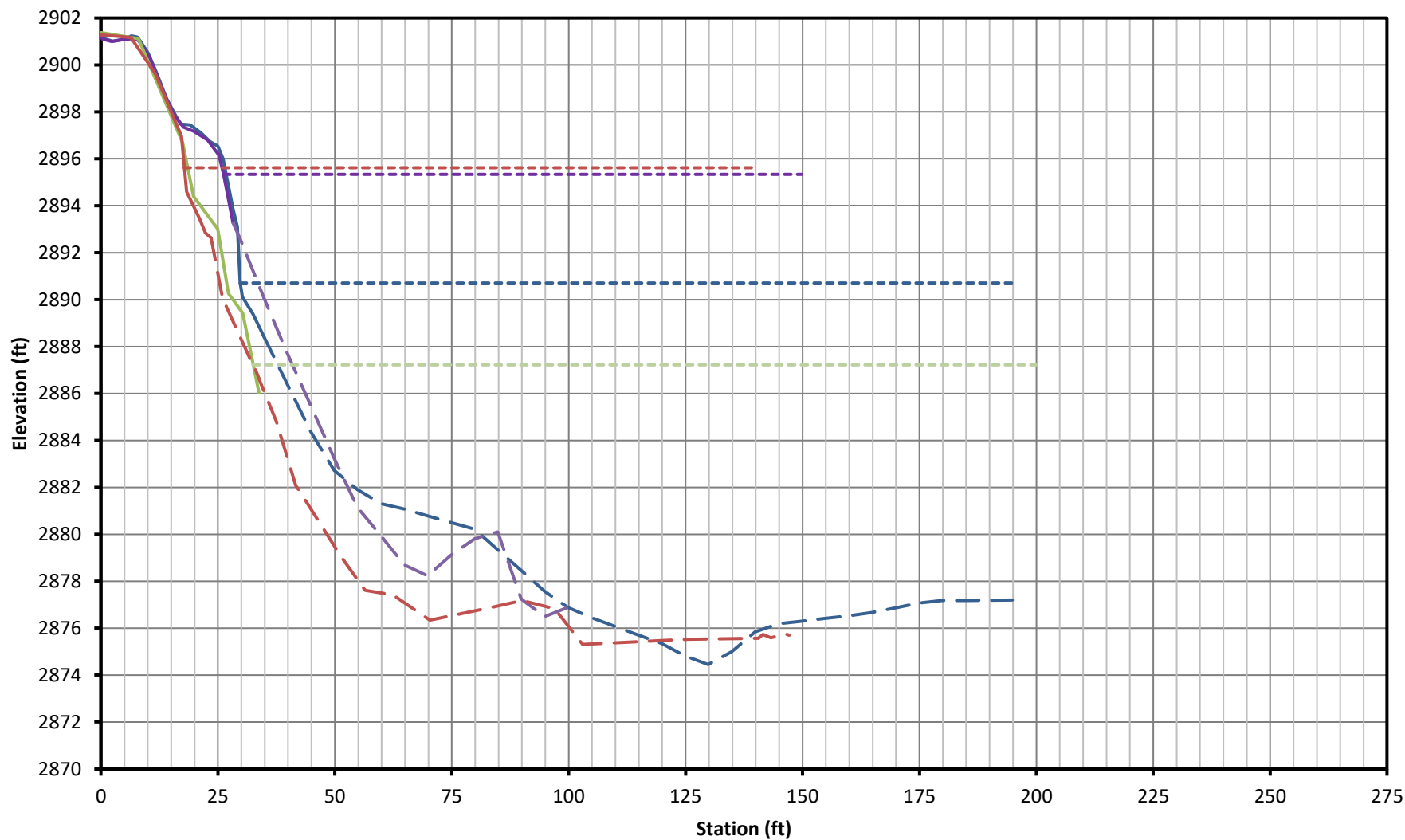
Foy's Bend Bank Transect #3



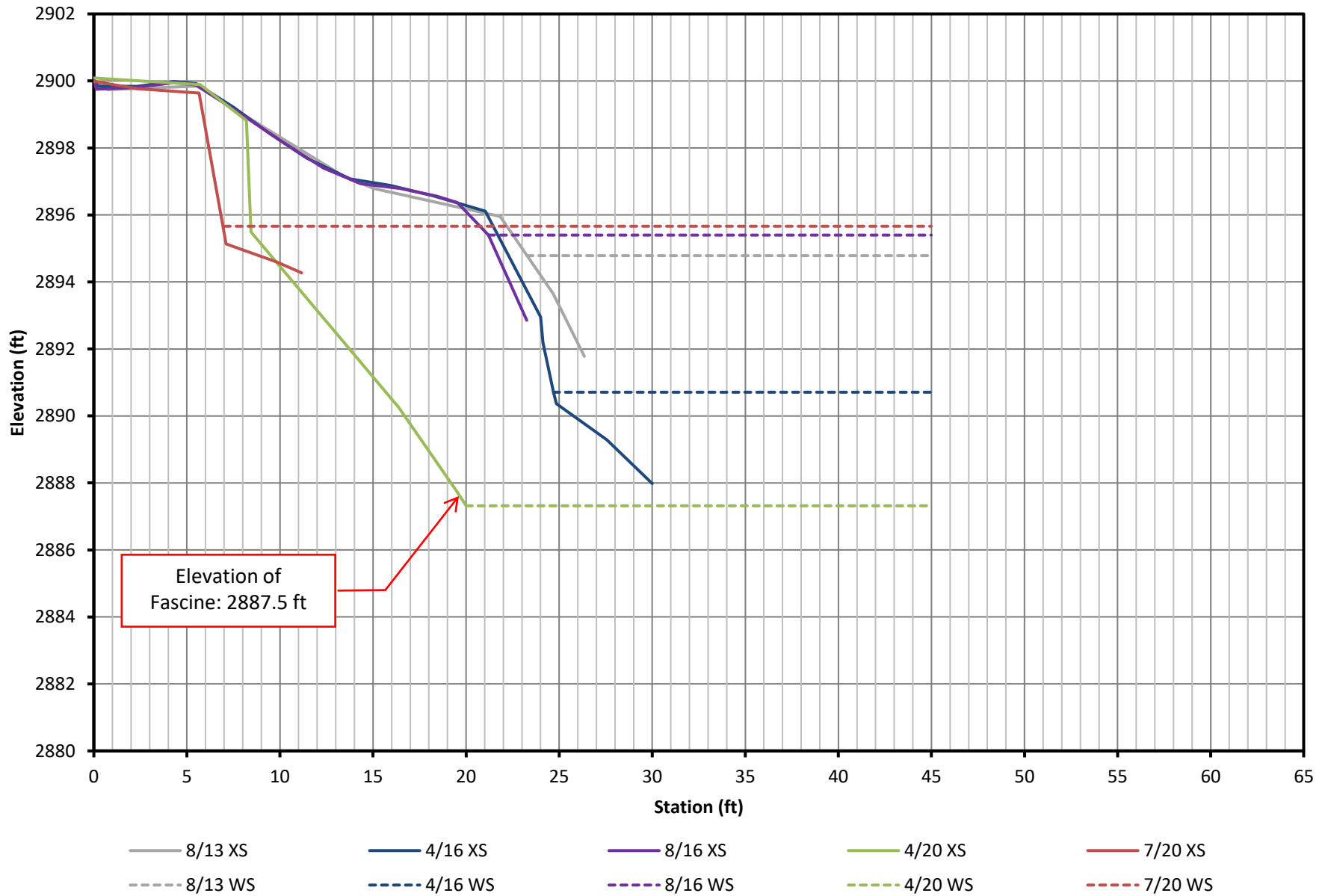
Foy's Bend Upper Bank Transect #3.5



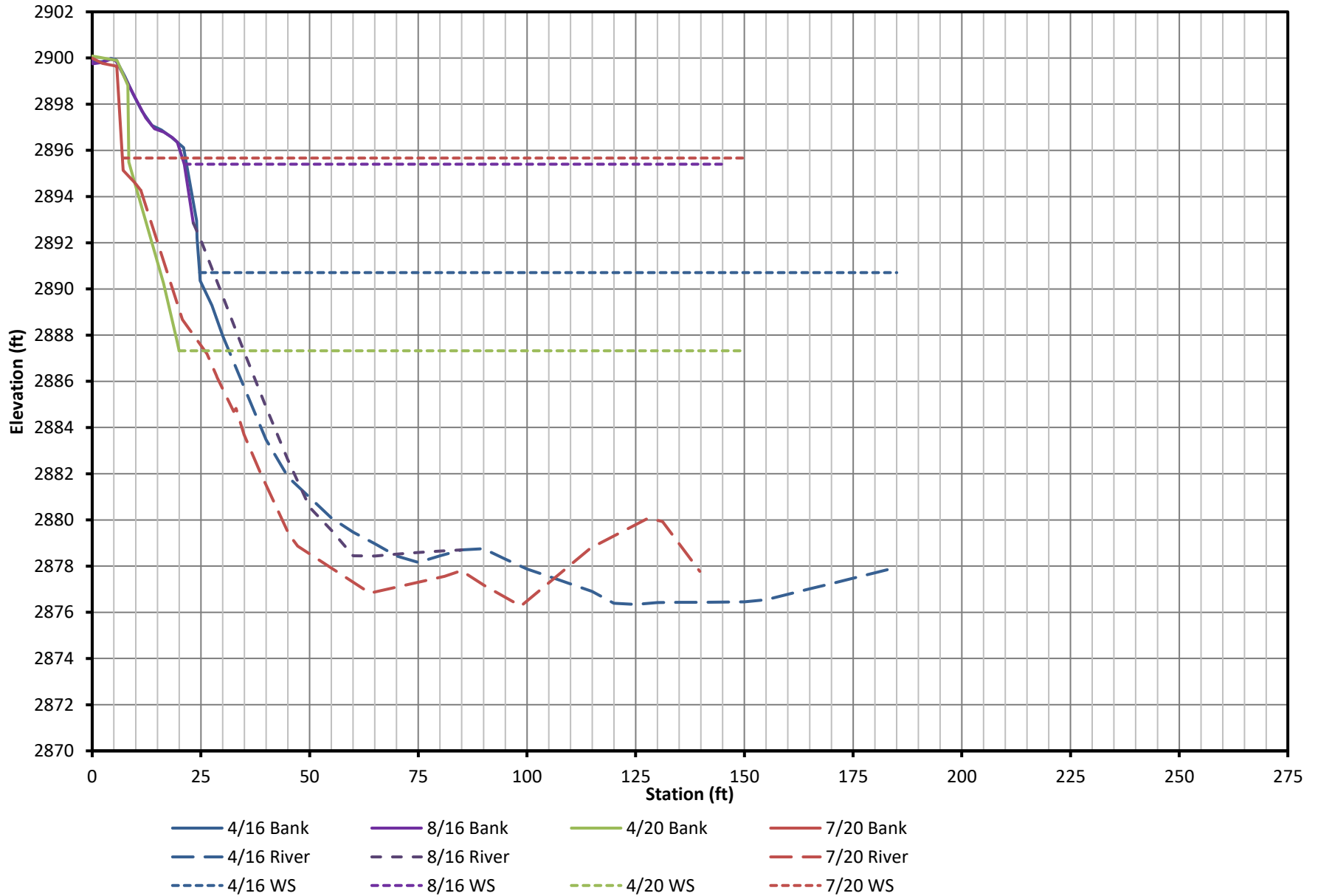
Foy's Bend Bank Transect #3.5



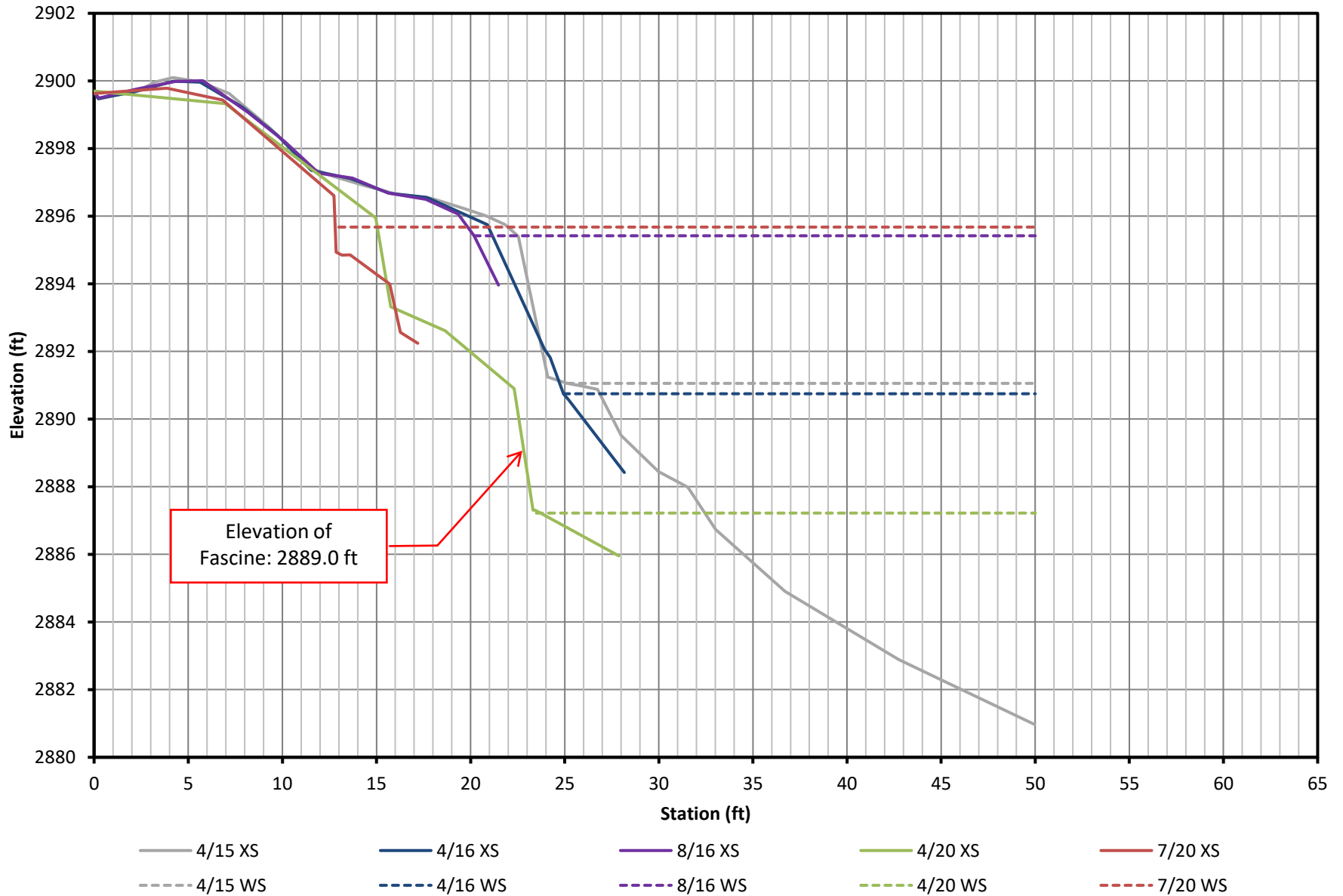
Foy's Bend Upper Bank Transect #4



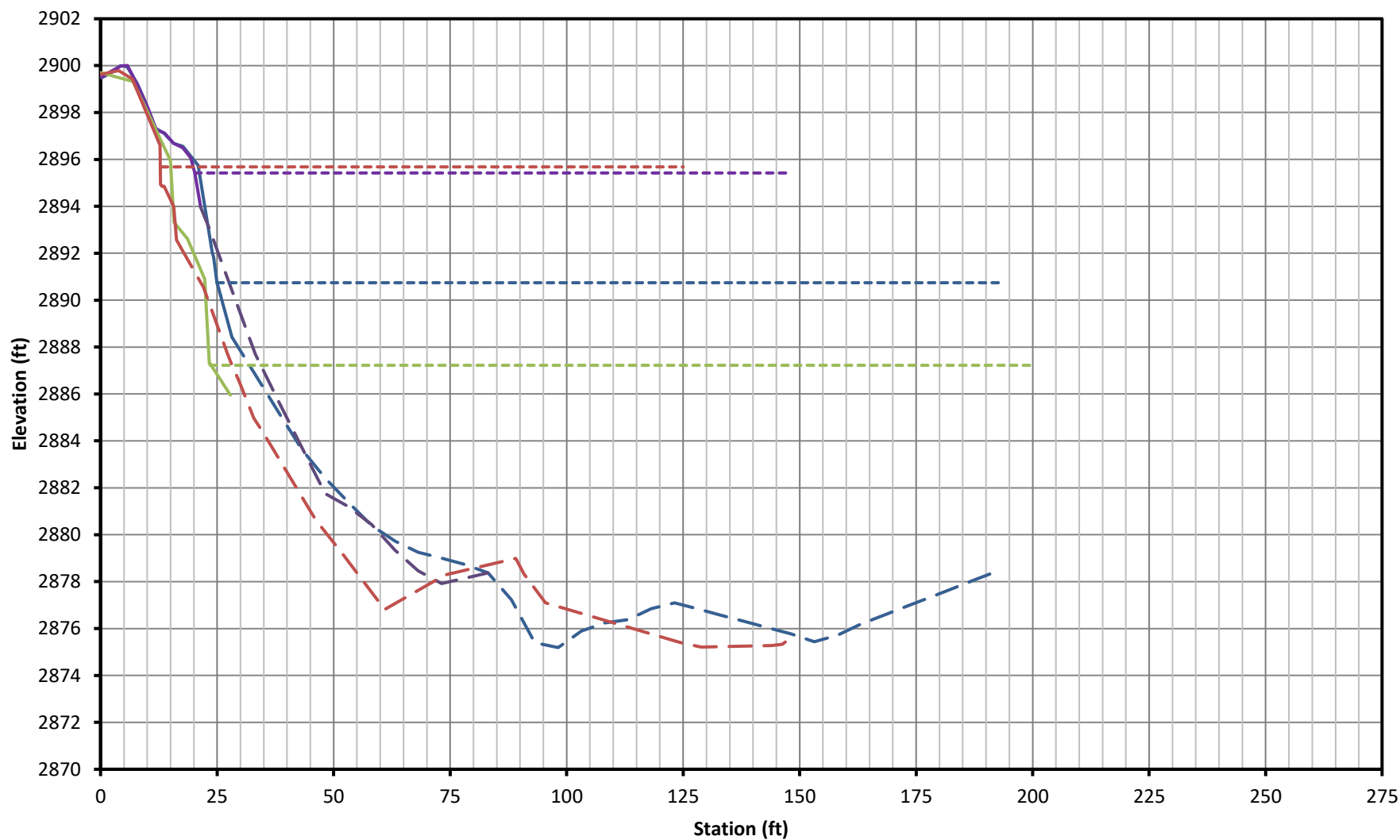
Foy's Bend Bank Transect #4



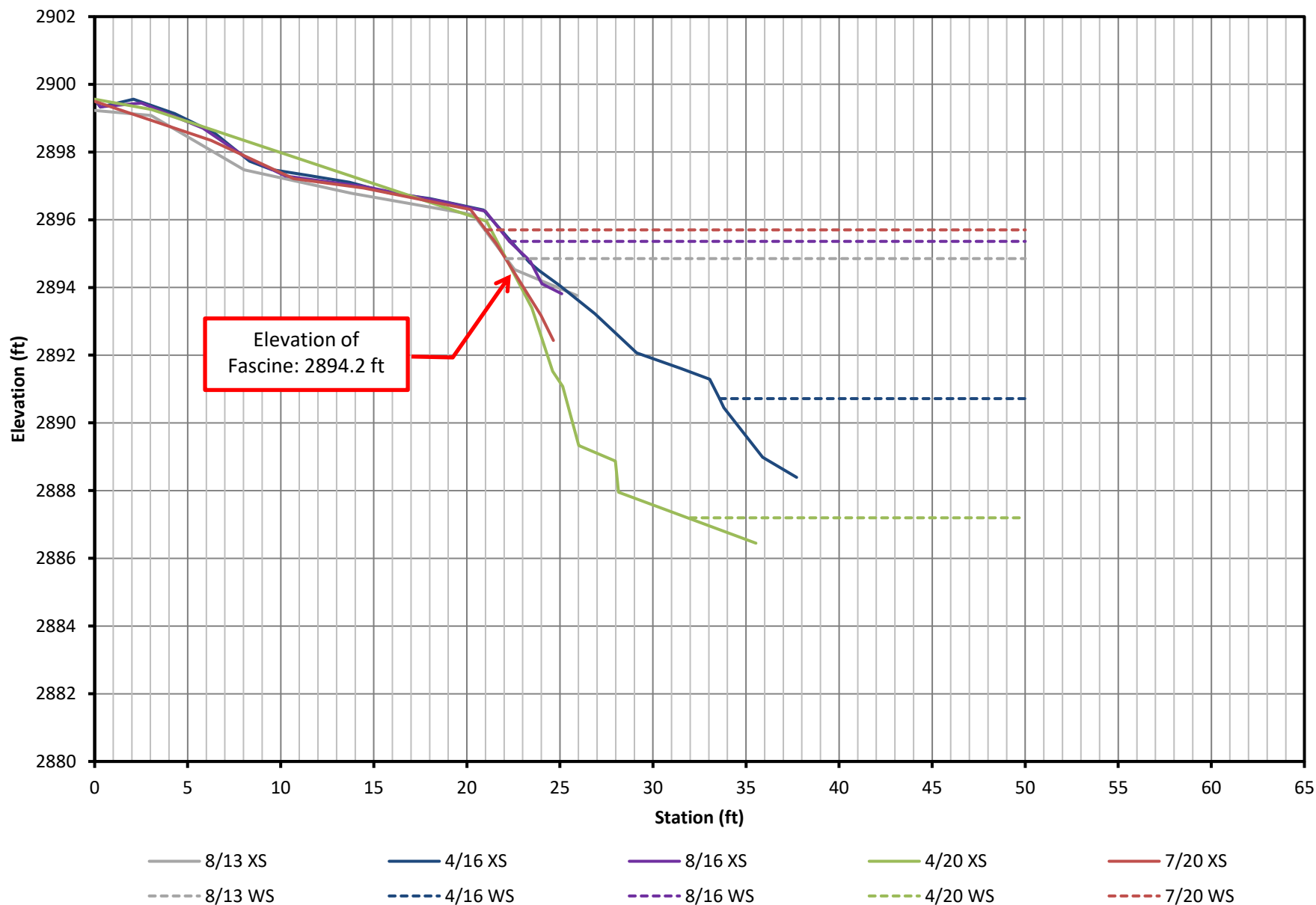
Foy's Bend Upper Bank Transect #4.5



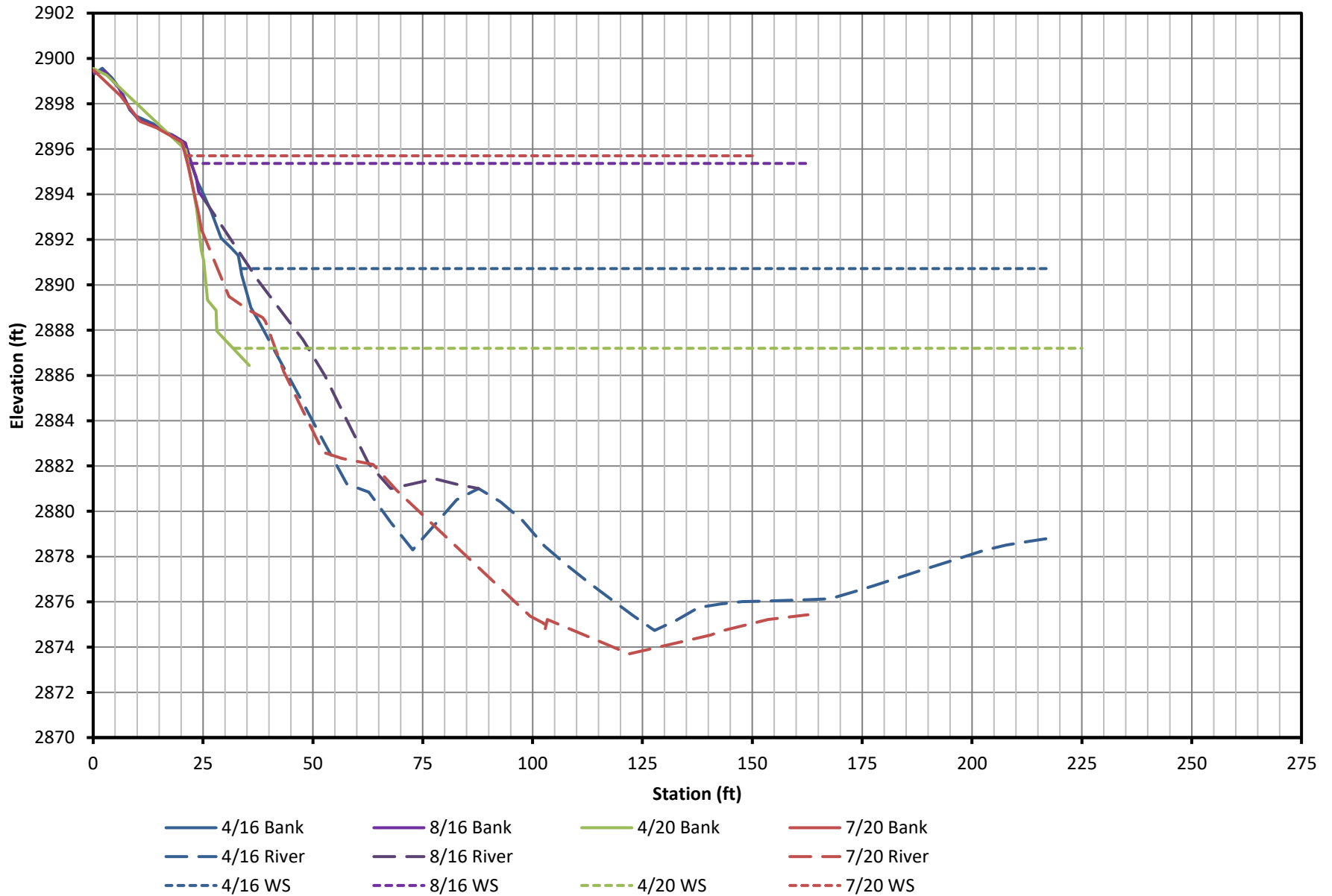
Foy's Bend Bank Transect #4.5



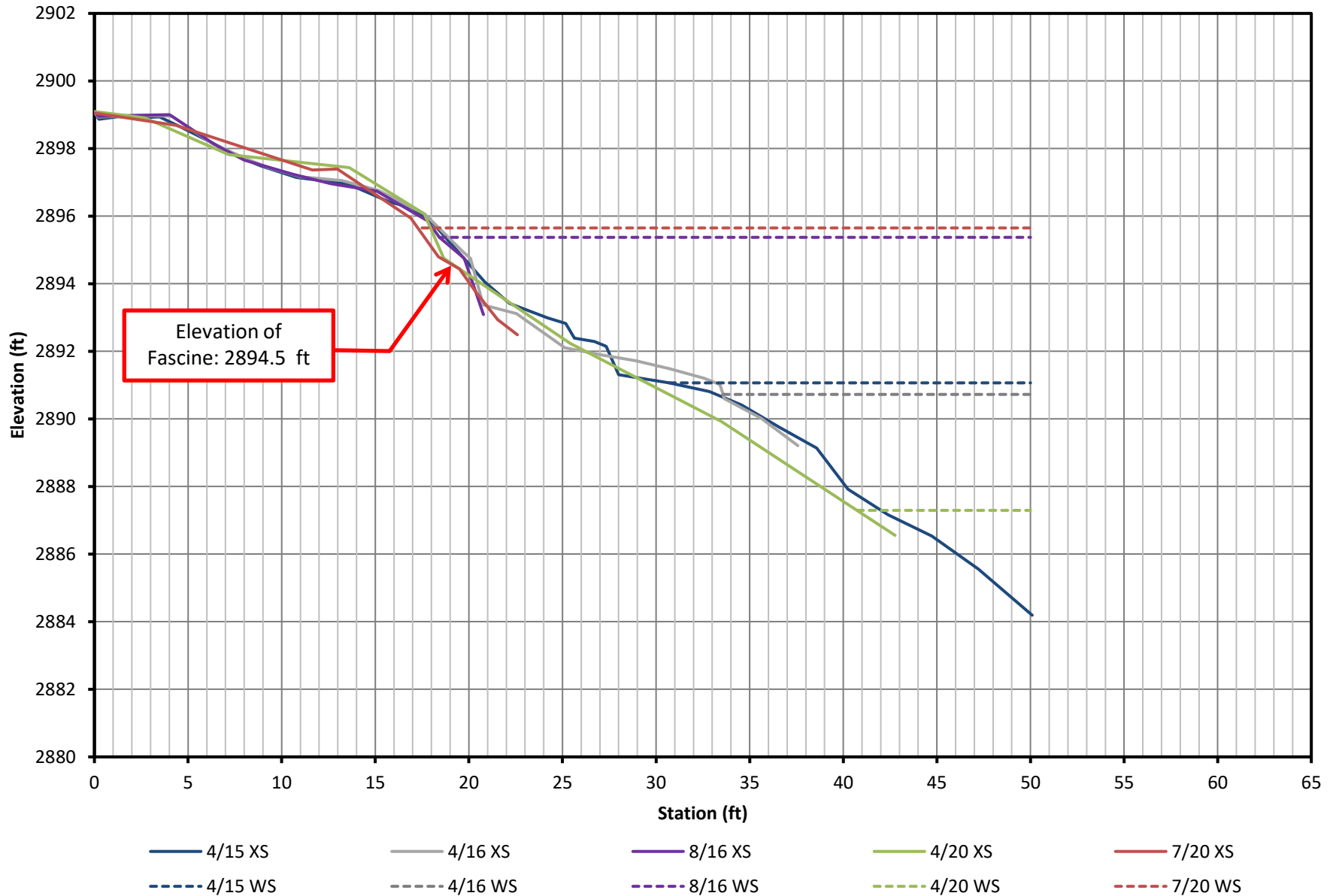
Foy's Bend Upper Bank Transect #5



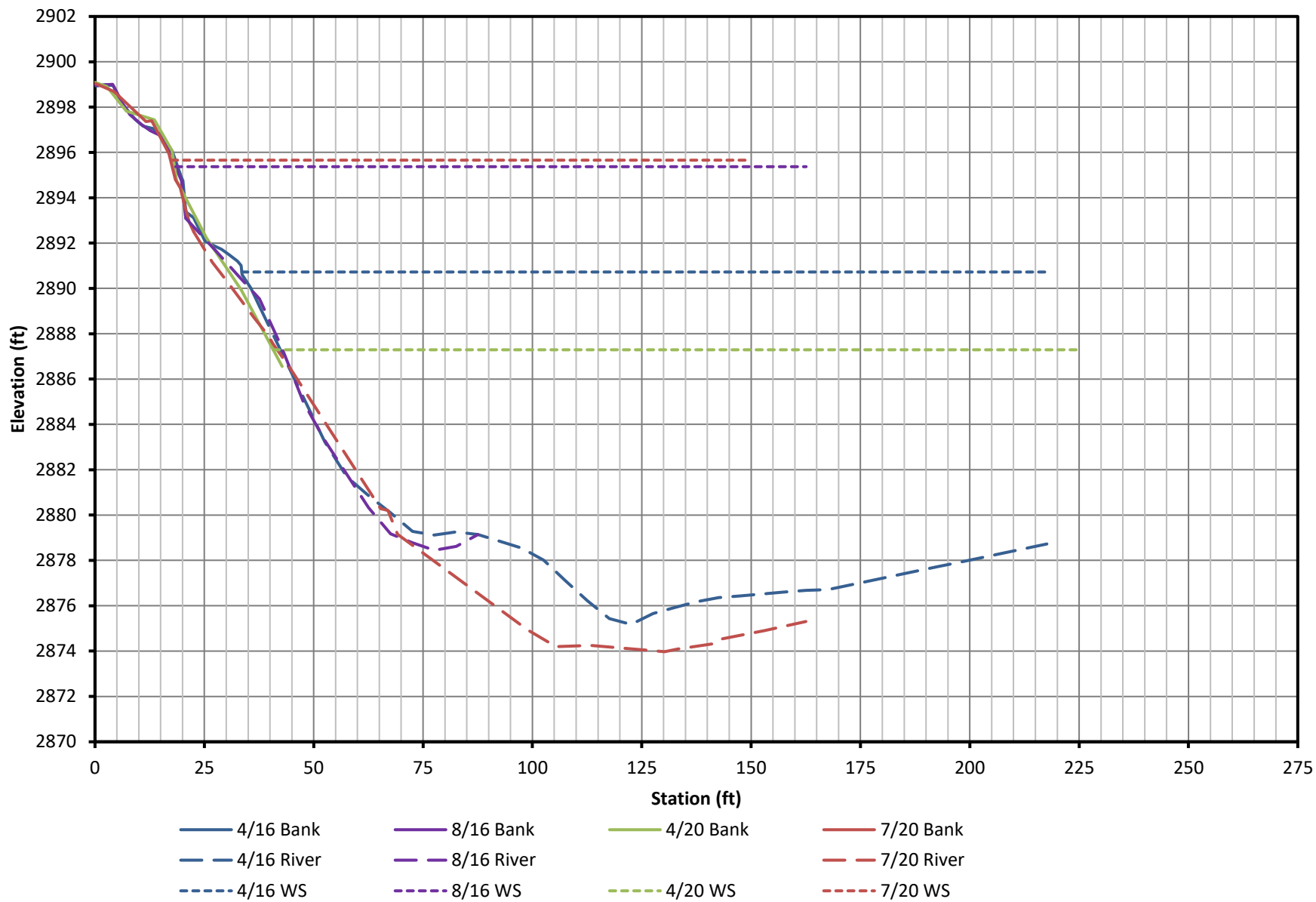
Foy's Bend Bank Transect #5



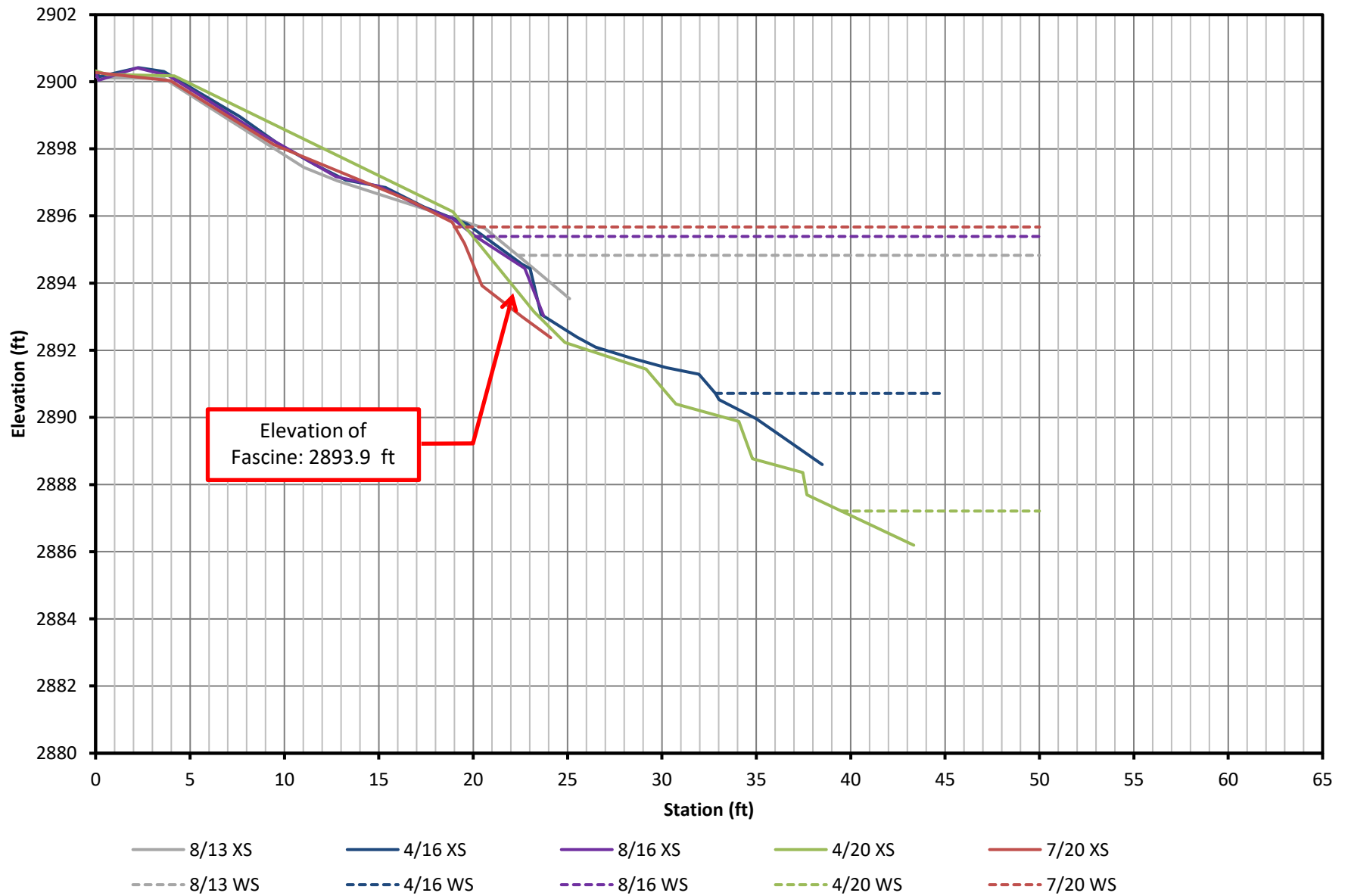
Foy's Bend Upper Bank Transect #5.5



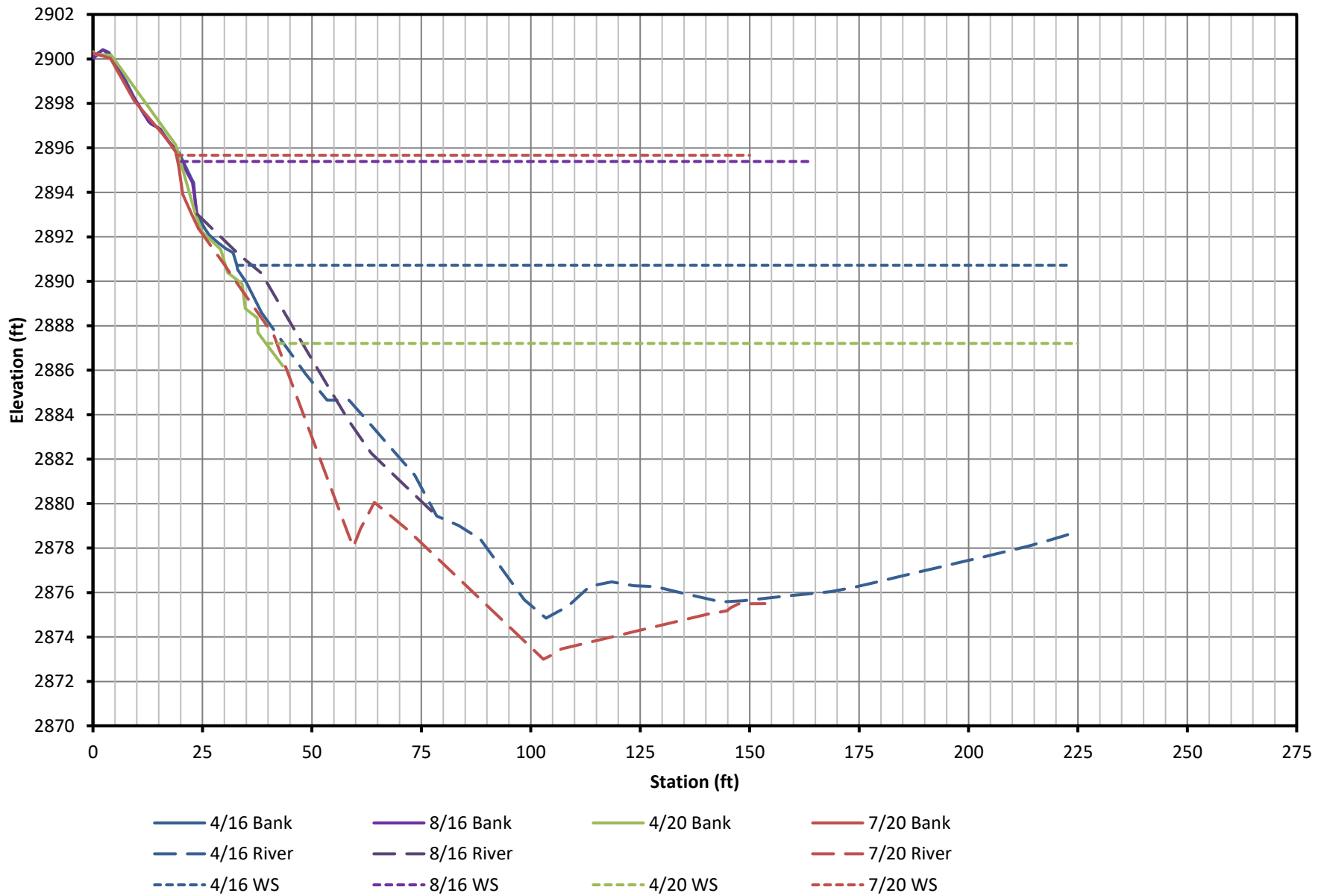
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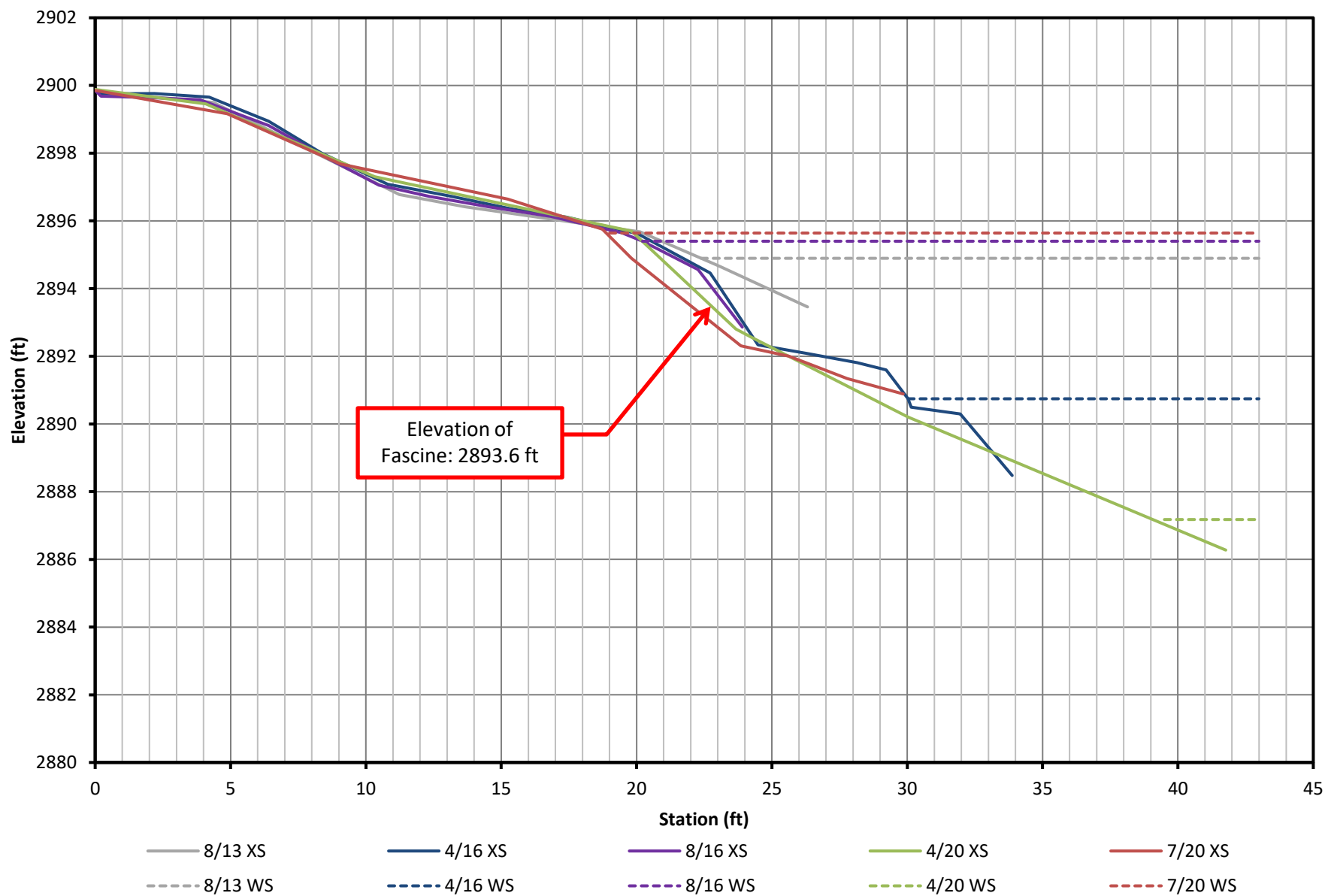
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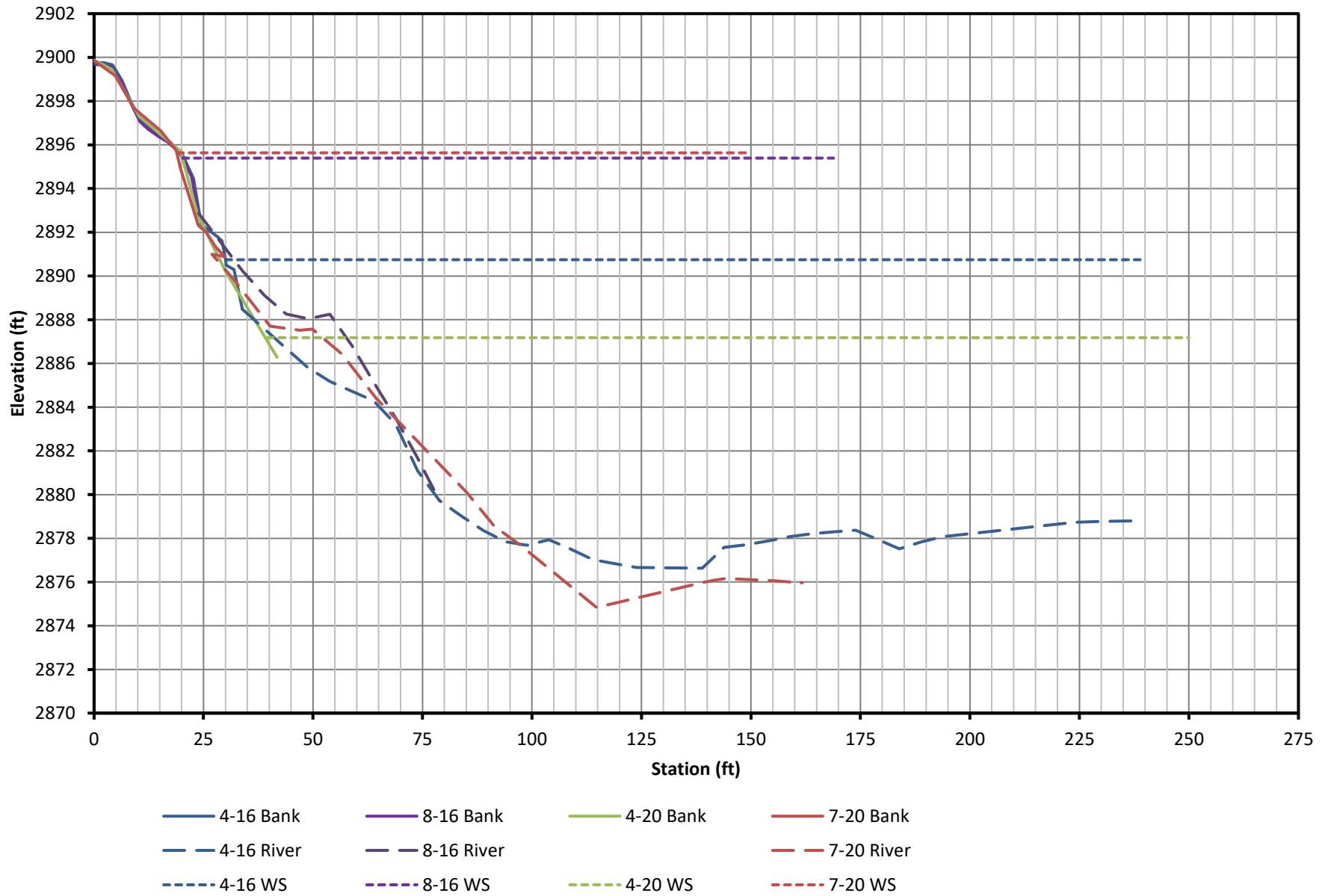
Foy's Bend Bank Transect #6



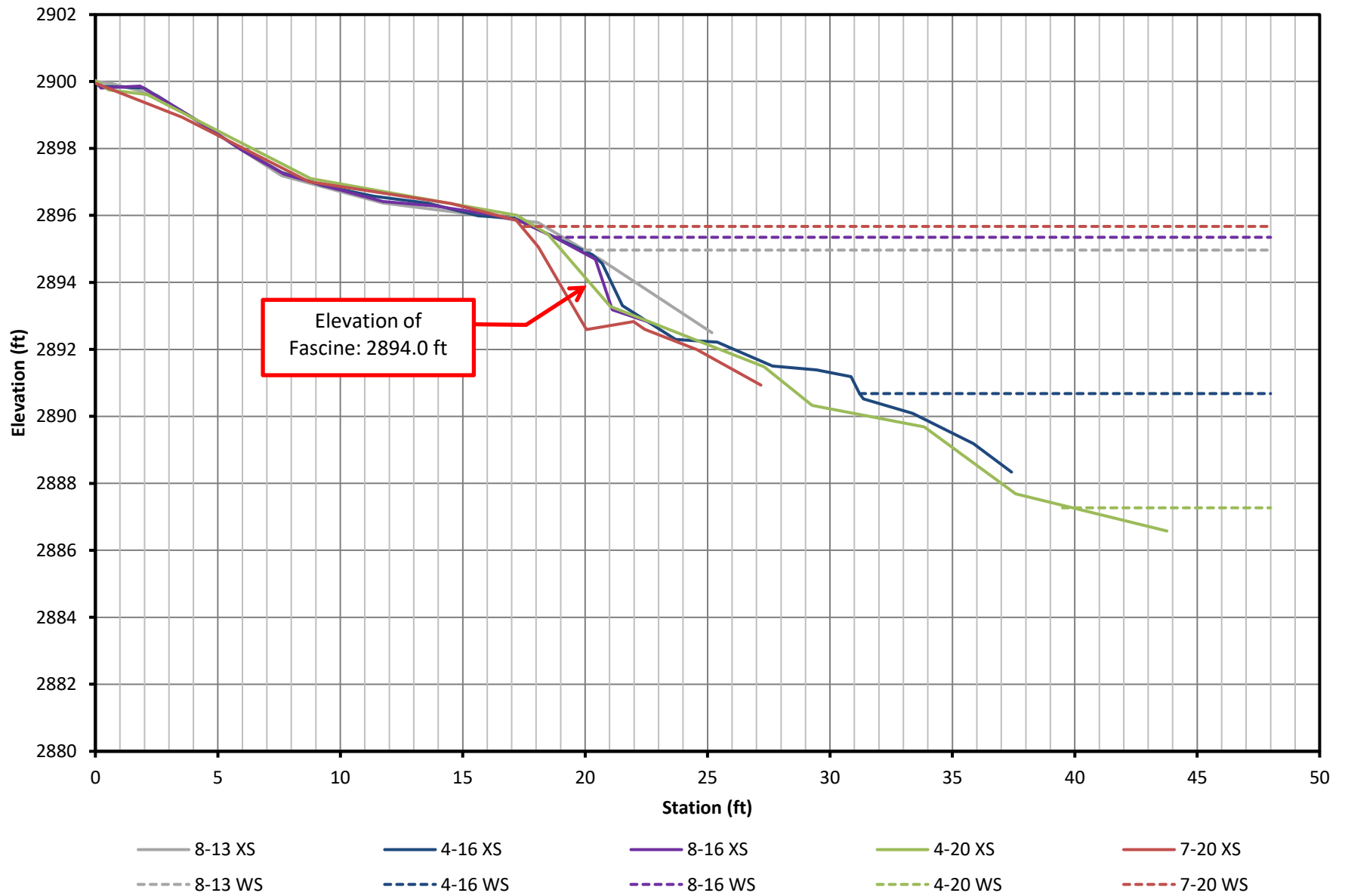
Foy's Bend Upper Bank Transect #7



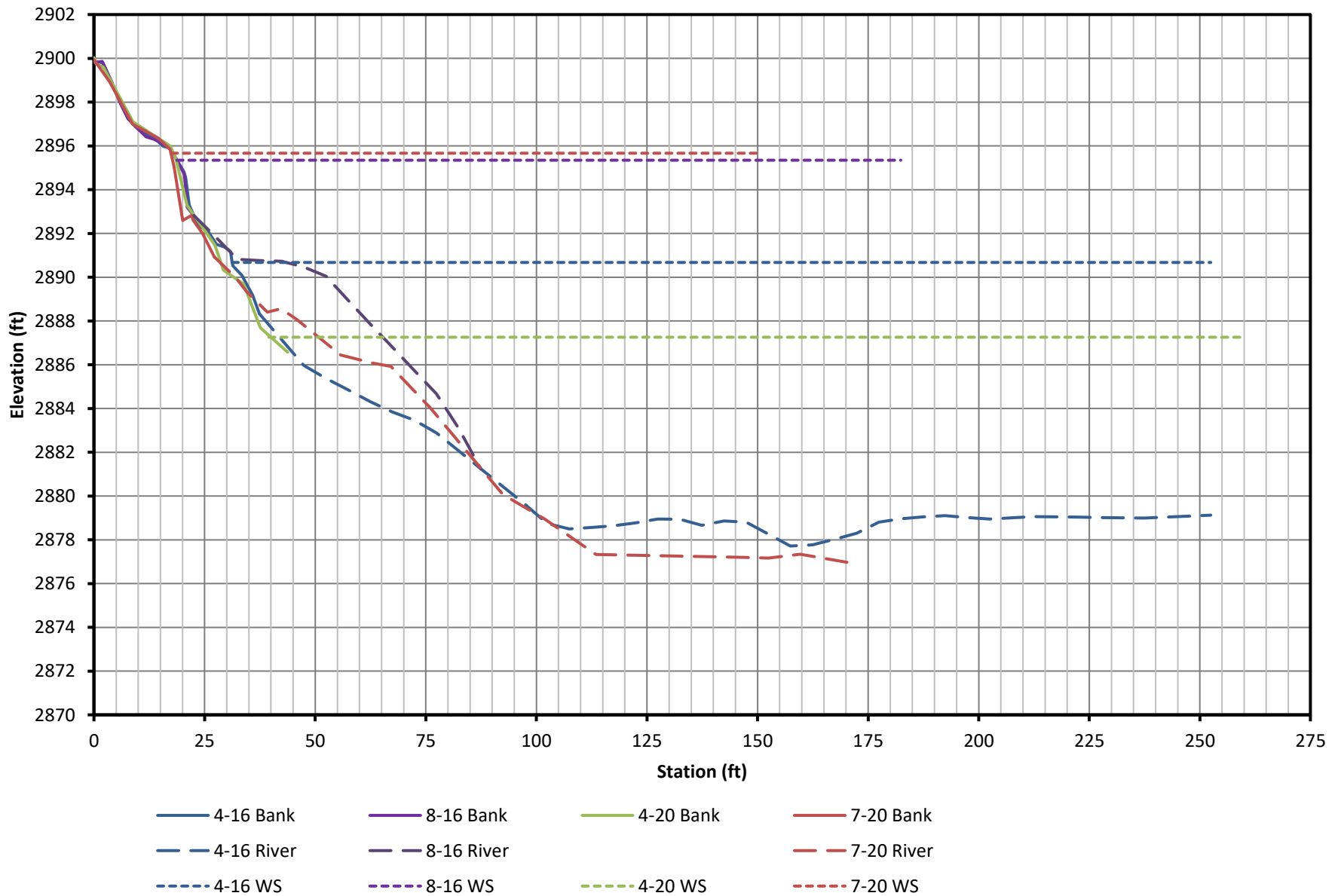
Foy's Bend Bank Transect #7



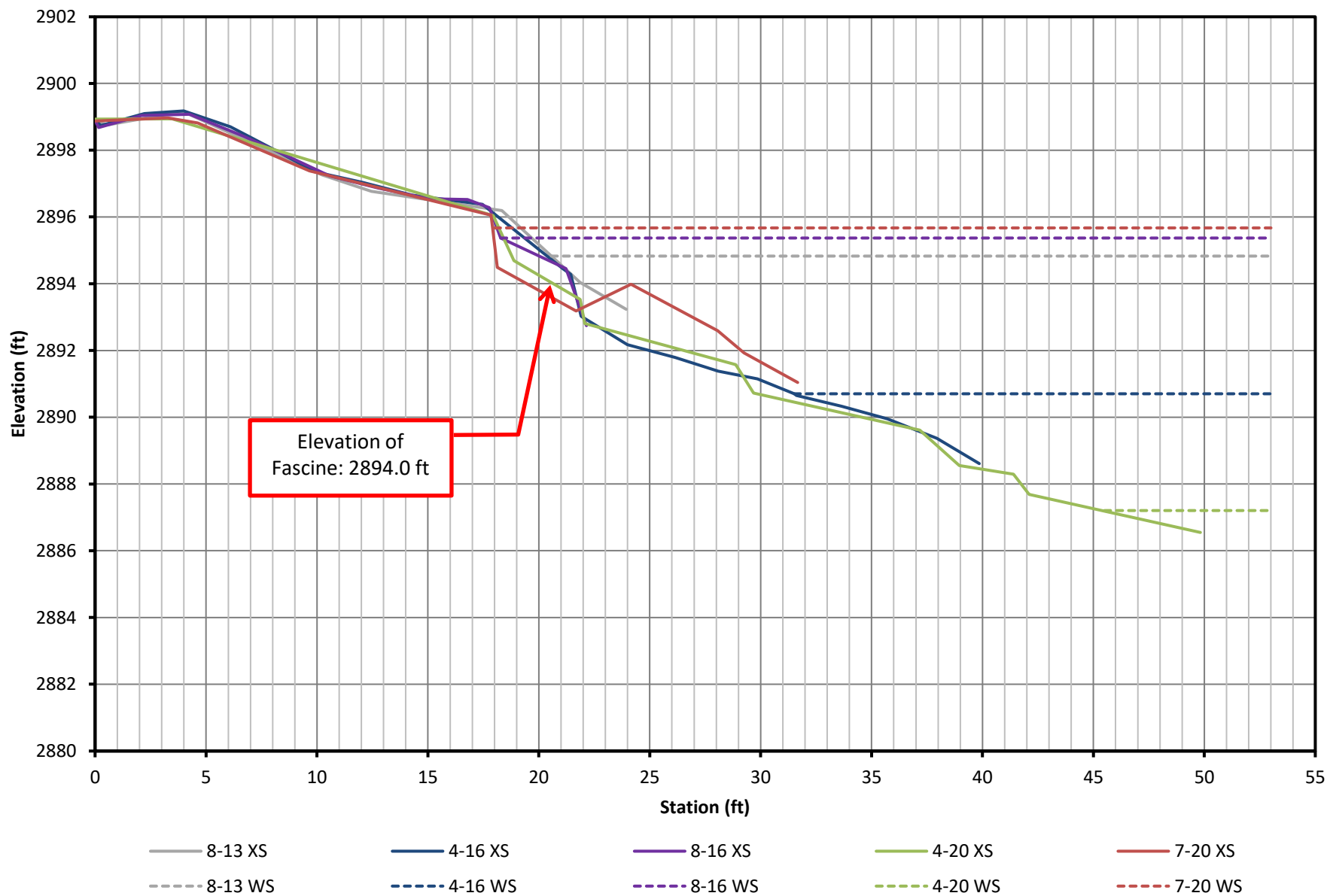
Foy's Bend Upper Bank Transect #8



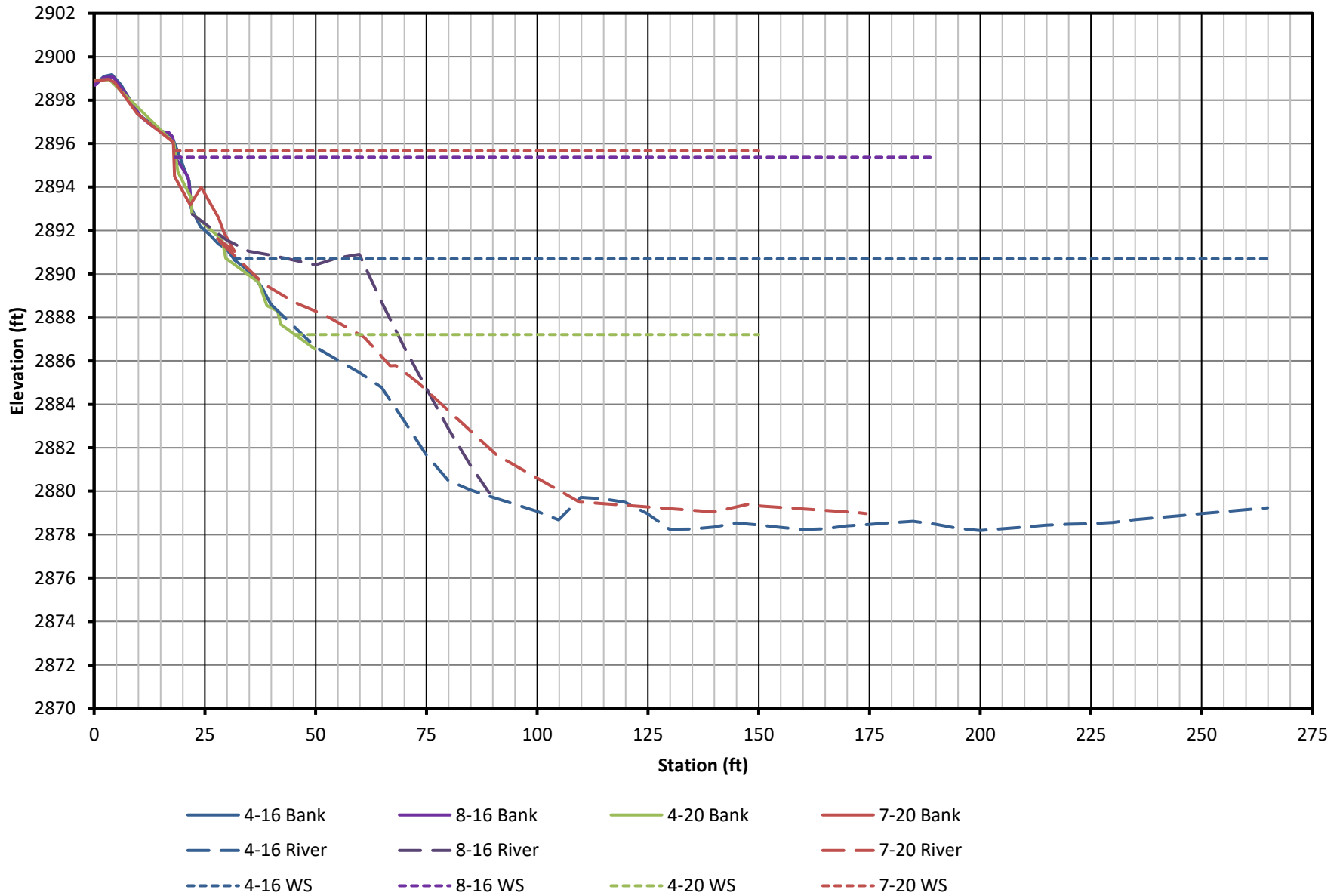
Foy's Bend Bank Transect #8



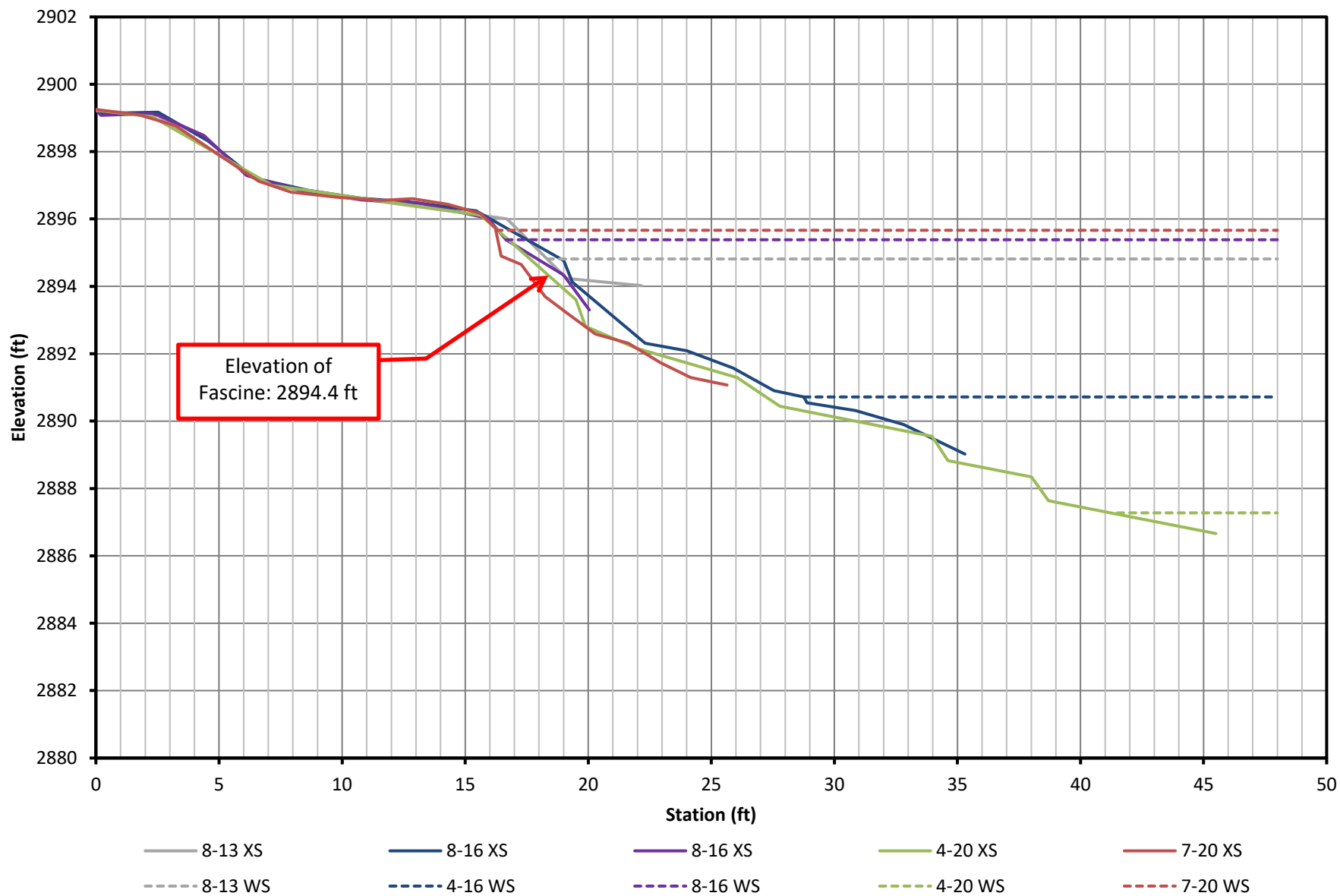
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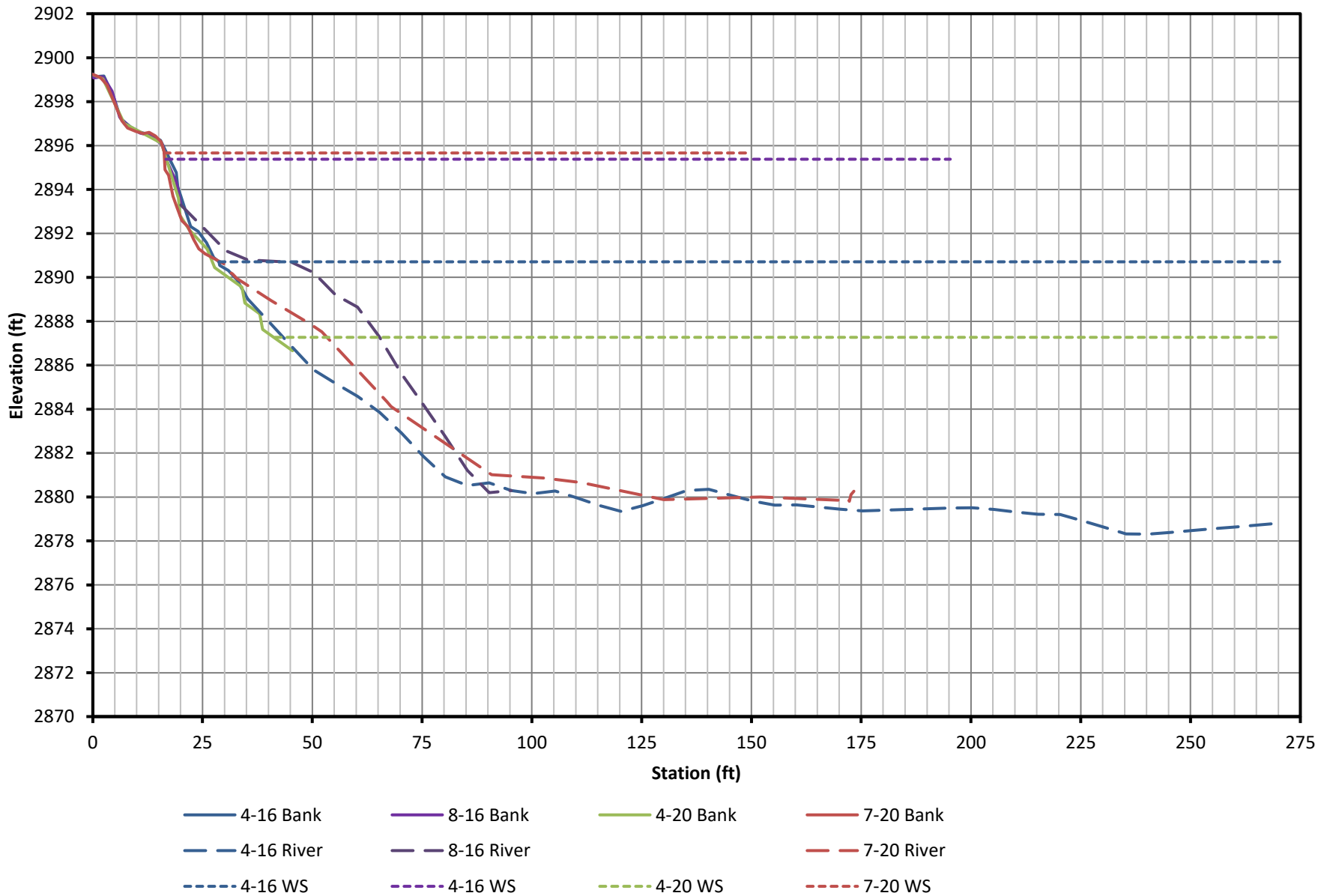
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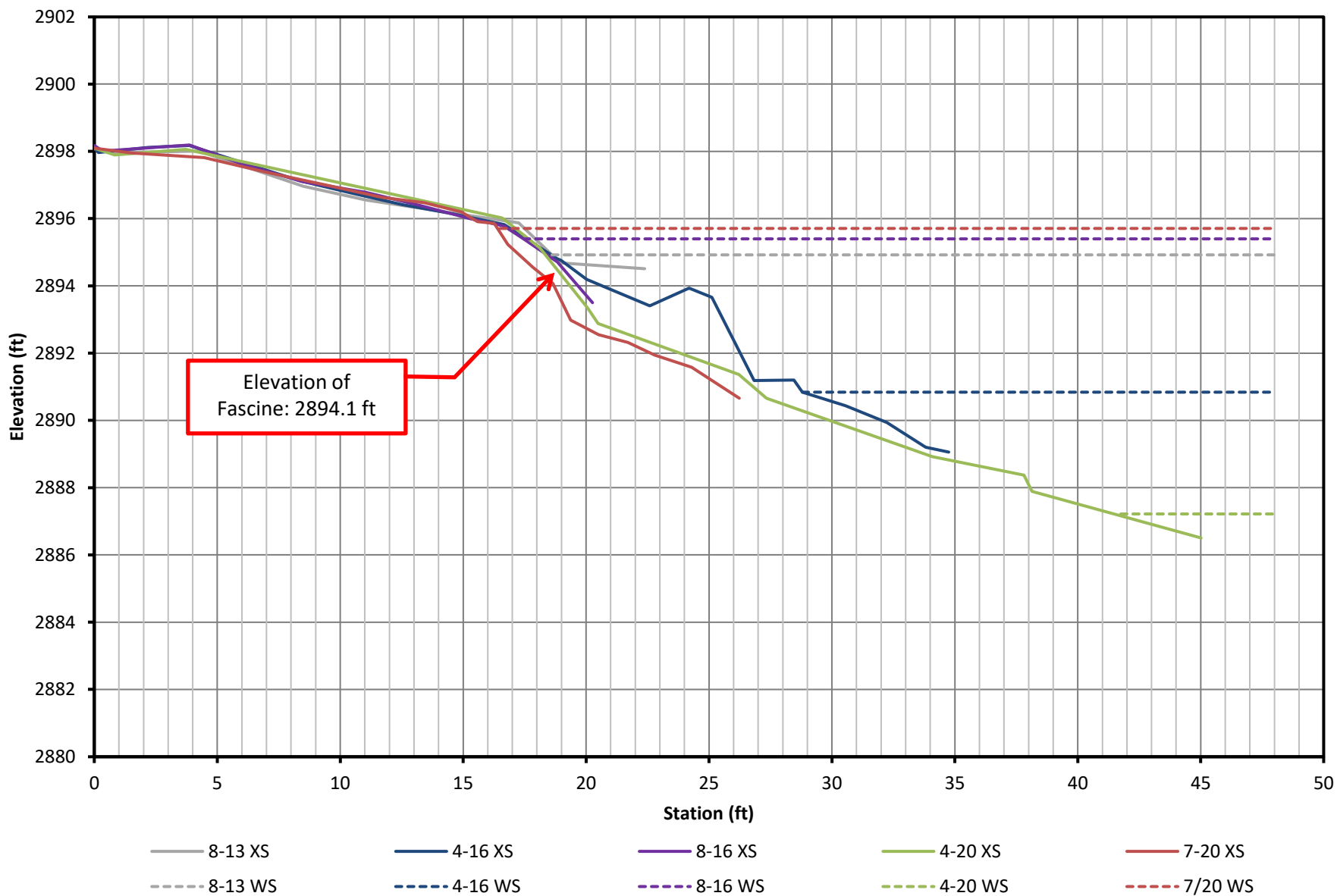
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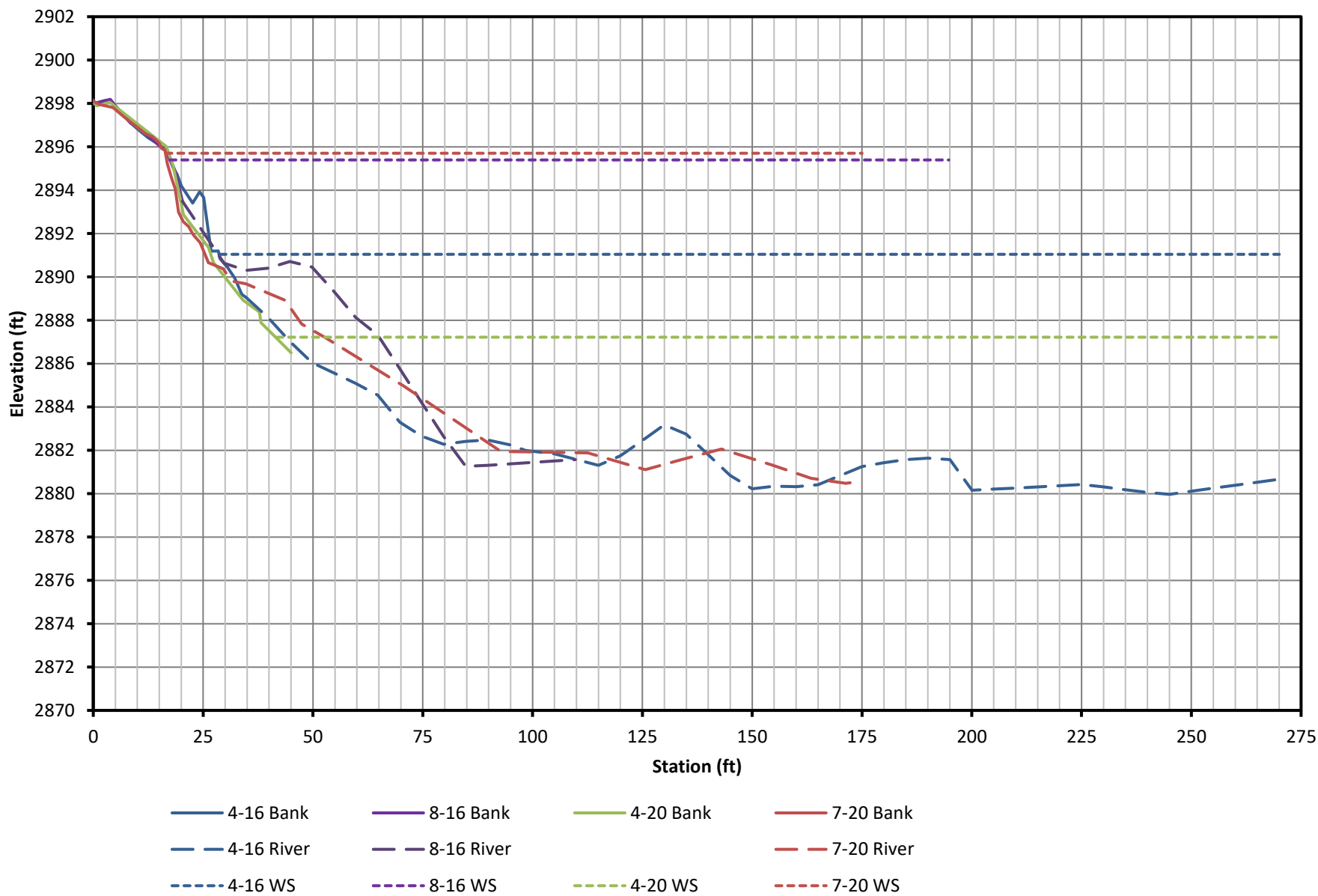
Foy's Bend Bank Transect #10



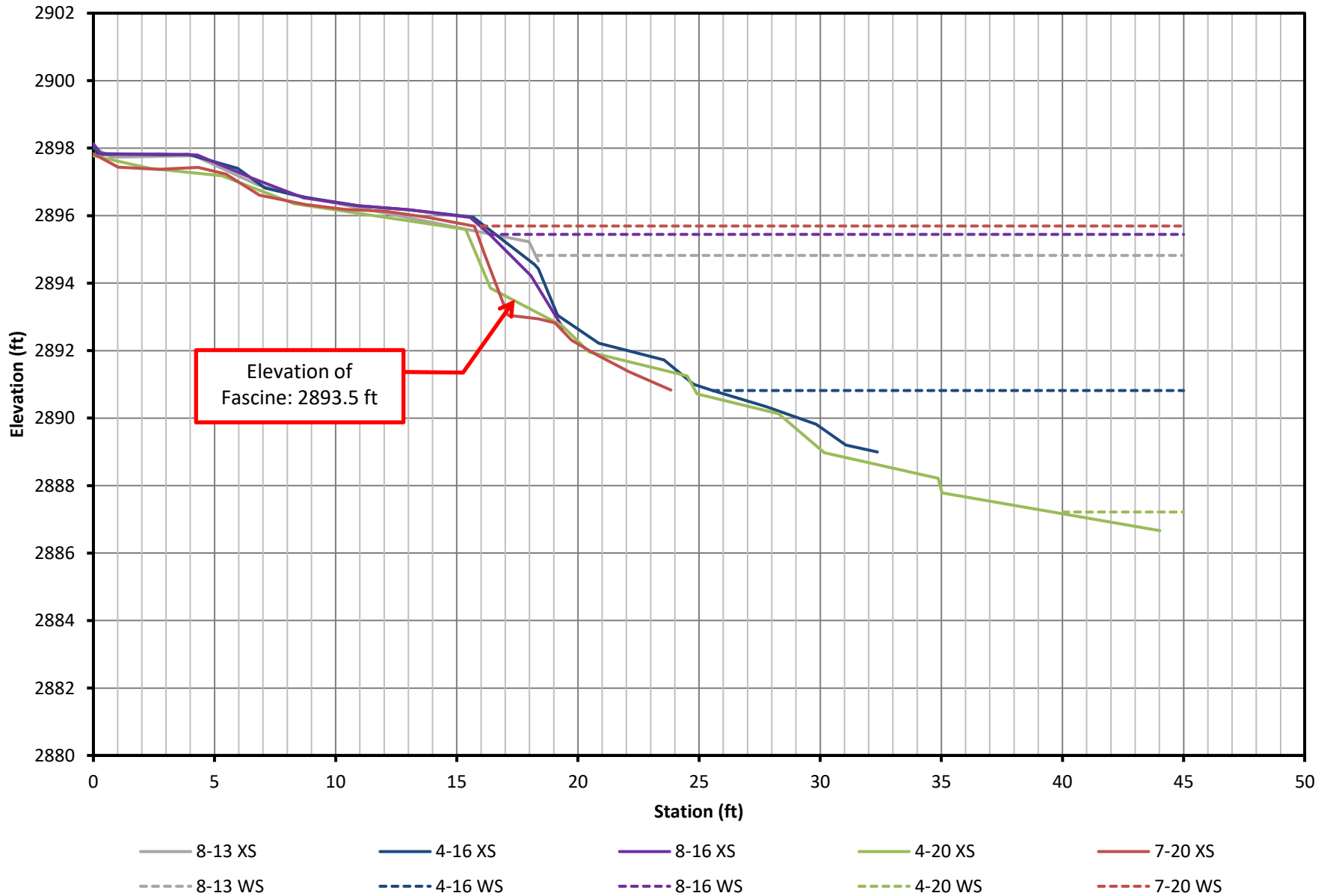
Foy's Bend Upper Bank Transect #11



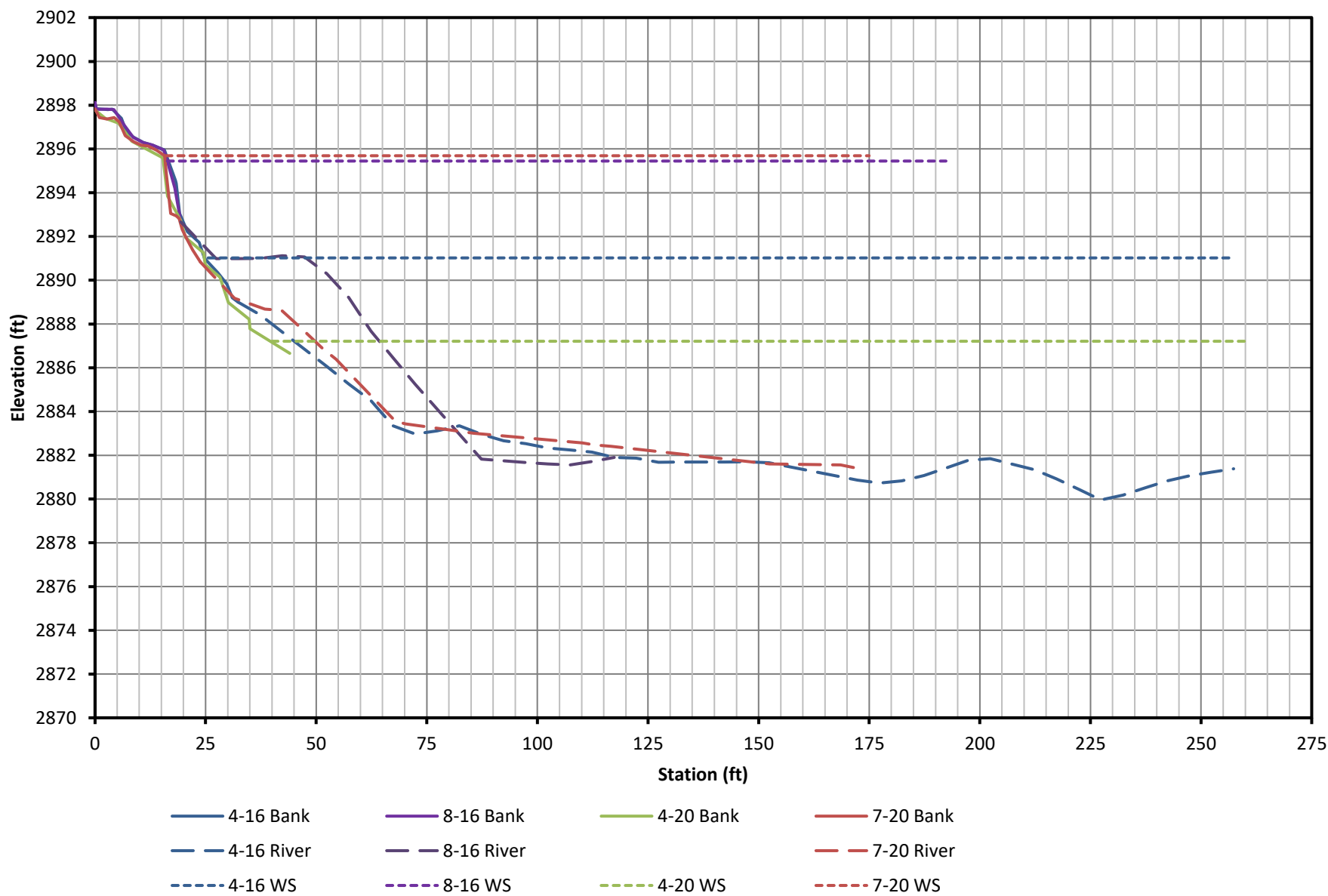
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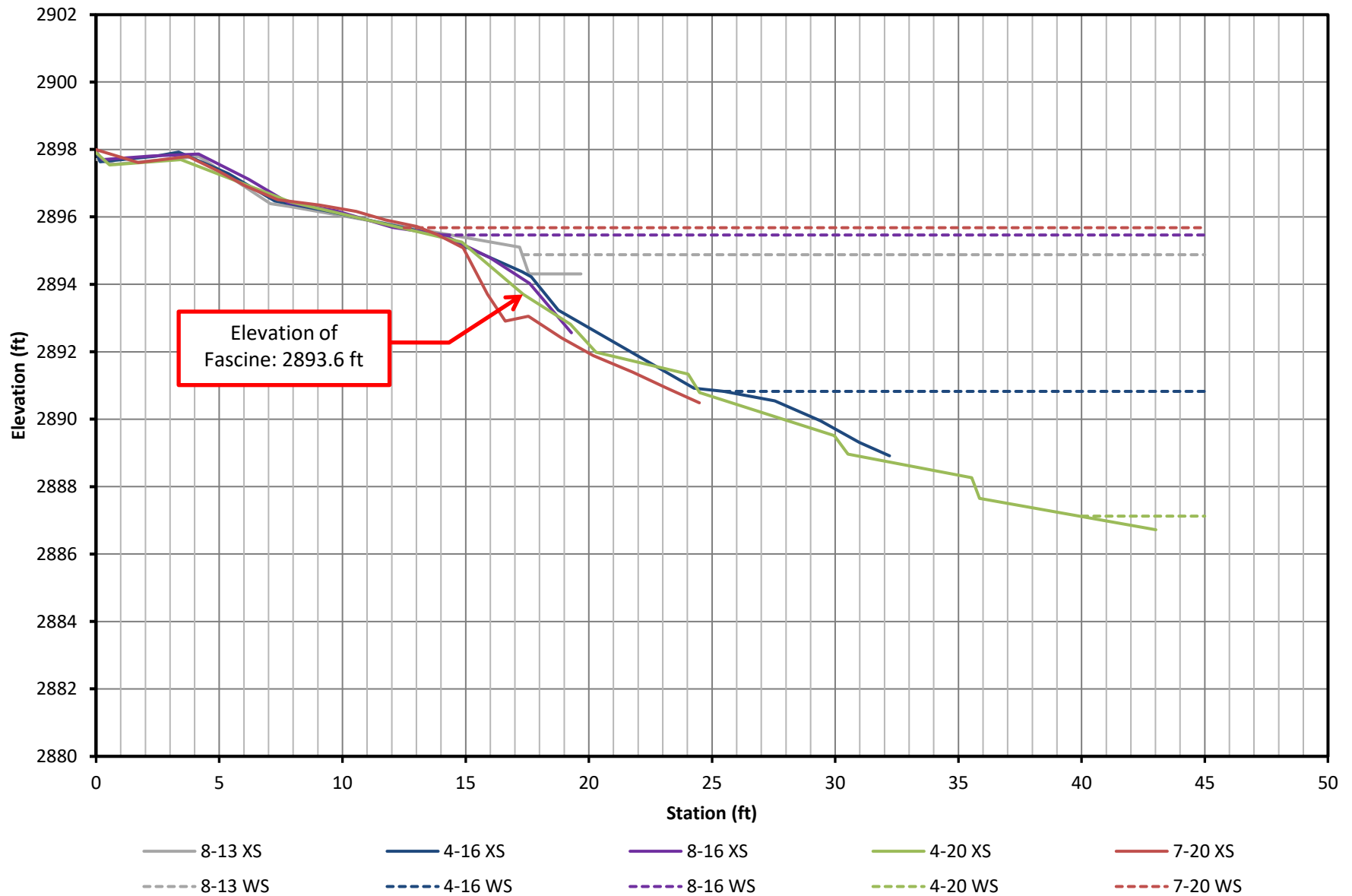
Foy's Bend UpperBank Transect #12



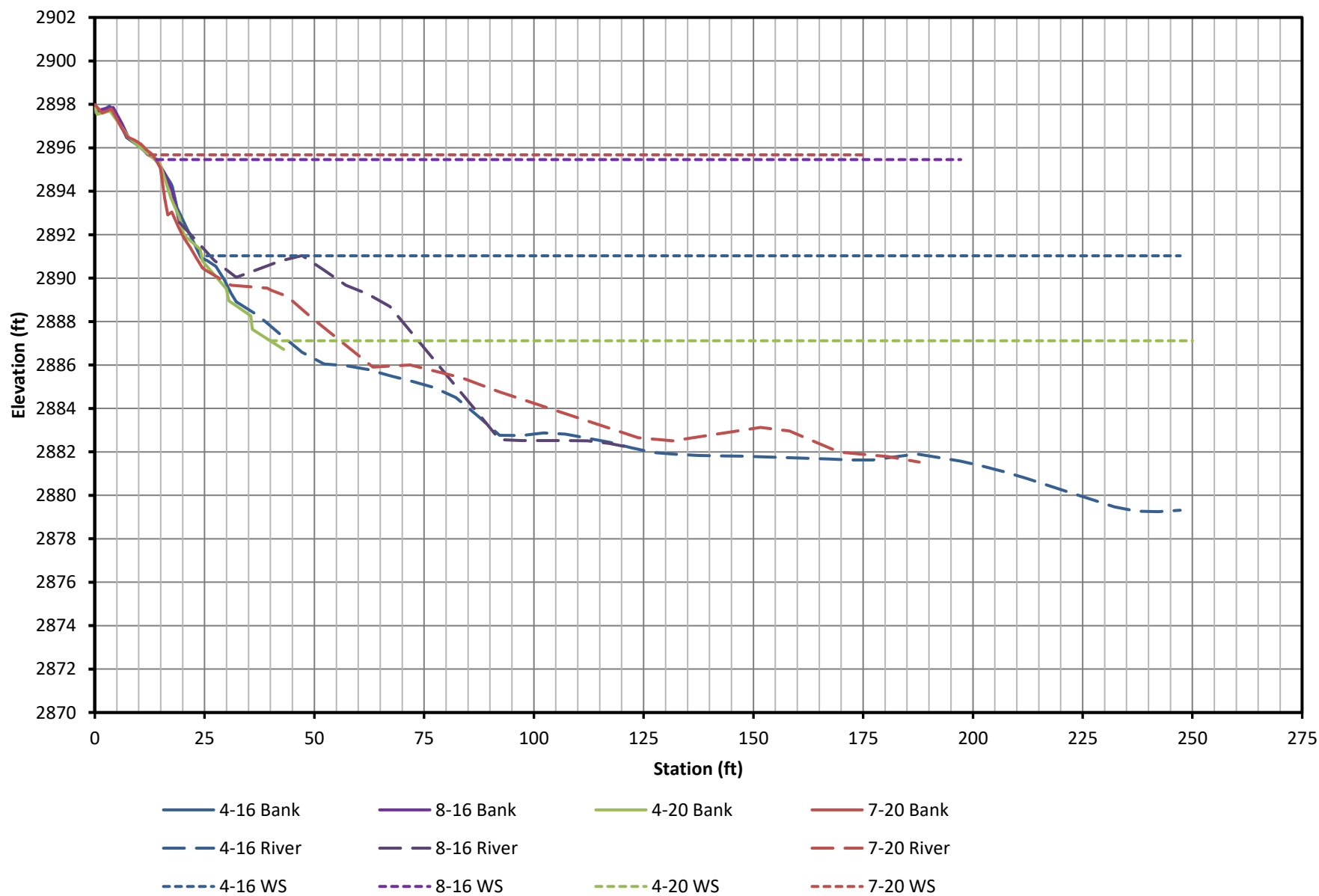
Foy's Bend Bank Transect #12



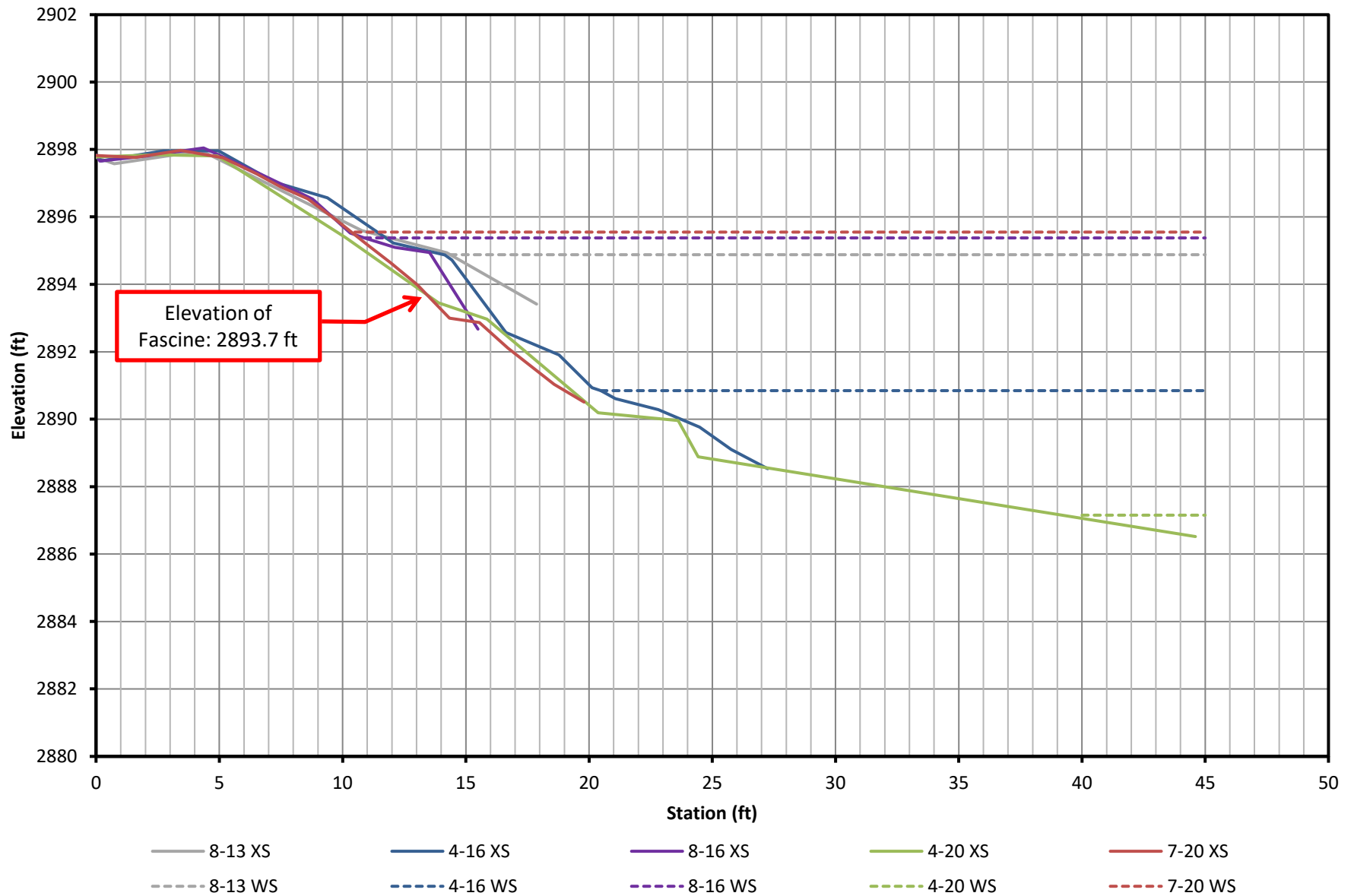
Foy's Bend Upper Bank Transect #13



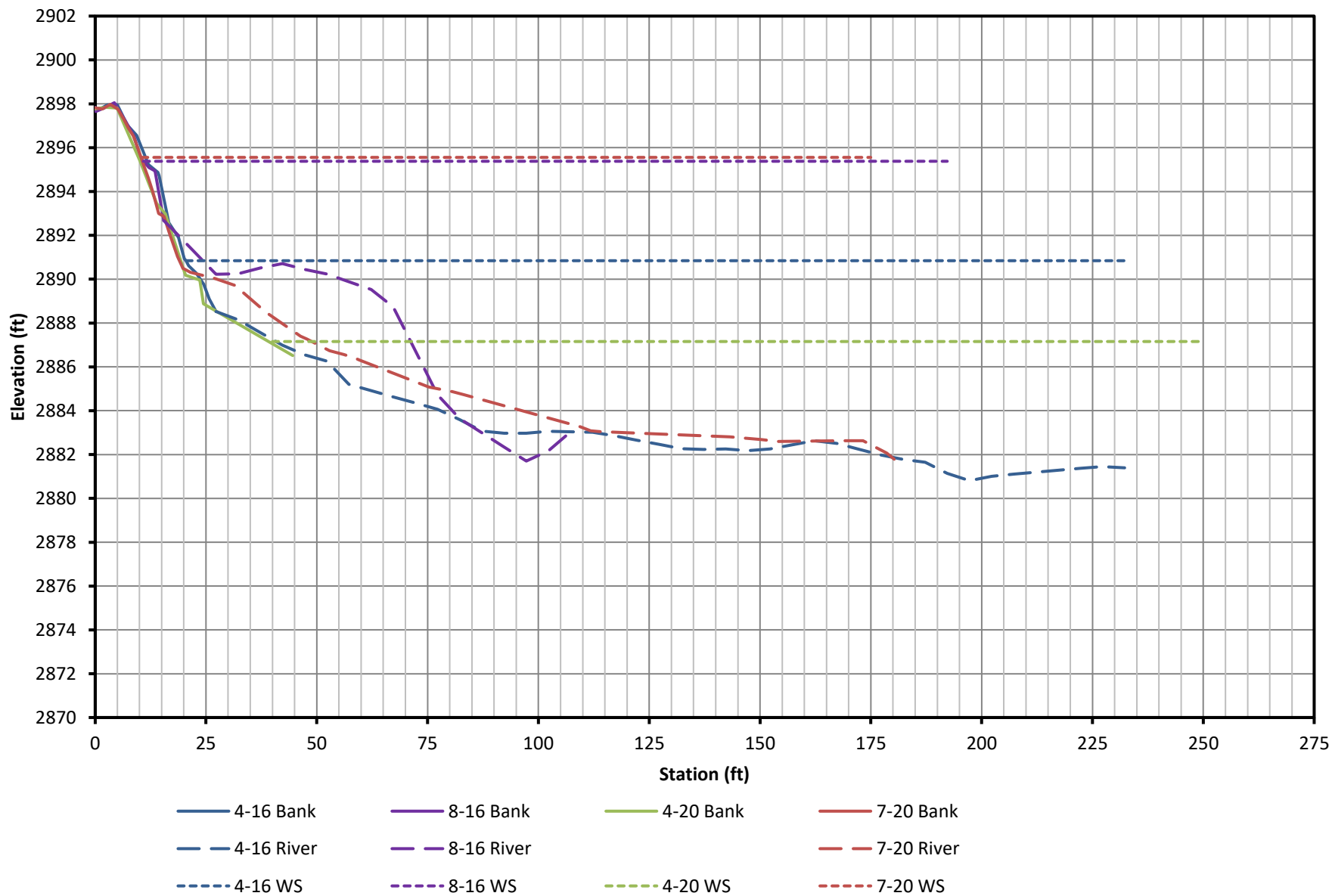
Foy's Bend Bank Transect #13



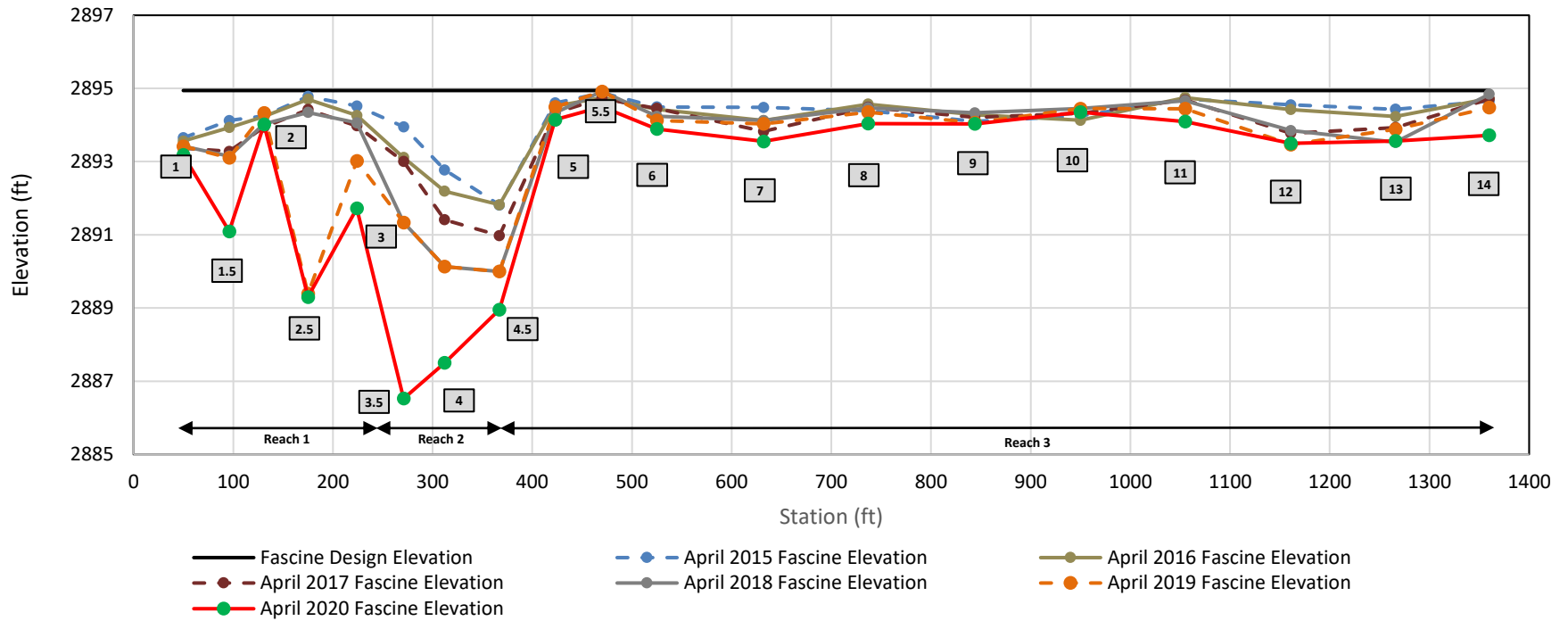
Foy's Bend Upper Bank Transect #14



Foy's Bend Bank Transect #14



Foy's Bend Fascine Profile



APPENDIX H

PLANTING EXCLOSURE COORDINATES

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

Table H-1. GPS coordinates for the Foy's Bend FCA planting exclosures. Coordinates are for the approximate center of each planting polygon.

Exclosure	Latitude	Longitude
1	48.1521766	-114.2591661
2	48.1517585	-114.2581302
3	48.1520560	-114.2544447
4	48.1519029	-114.2530195
5	48.1519709	-114.2517854
6	48.1527857	-114.2498706
7	48.1524992	-114.2439724
8	48.1522669	-114.2430871
9	48.1524174	-114.2414345
10	48.1529050	-114.2380840
11	48.1532986	-114.2367564
12	48.1537956	-114.2361153
13	48.1545324	-114.2344088
14	48.1542498	-114.2343209
15	48.1543388	-114.2328588
16	48.1550055	-114.2317072
17	48.1551462	-114.2327981
18	48.1565196	-114.2343658