

May 2020
Benton County

Riparian Buffer Analysis

Summary Memorandum

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Appendices
Appendix 1: Benton County Stream Maps

Background and Purpose

This memorandum is intended to assist in the development of stream and riparian buffer protections for Benton County's 2020 Critical Area Ordinance (CAO) and Shoreline Master Program update. Riparian conditions were assessed to provide context for stream buffer recommendations. This memorandum describes the methodology used to assess stream buffers and summarizes the results.

Methodology Summary

Riparian areas in Benton County were analyzed based on a series of cross section measurements using GIS and available aerial imagery. For each stream segment, the channel width and riparian vegetation width of each bank were measured, and the average, maximum, and minimum widths were determined. Stream segments were identified based on uniform characteristics and logical breaks, such as road crossings. In total 29 stream segments were analyzed, using over 300 cross section measurements.

Data Sources

The analysis was performed using ESRI ArcGIS Pro and Google Earth Pro software. The data and sources used in the analysis are summarized in Table 1.

Table 1: GIS Data and Data Sources

GIS Data	Source(s)
Aerial imagery	Google, ESRI, and Benton County
Benton County Roads	Benton County GIS, Washington DOT
Cities and UGAs	Benton County GIS
County Boundaries	USDA Geospatial Data Gateway
Named Streams/ topographic lows	Benton County GIS
National Wetlands Inventory	U.S. Fish and Wildlife Service
Public Lands	Washington Recreation and Conservation Office
Shoreline Jurisdiction	Benton County GIS
Streams and waterbodies	WA DNR Hydrography Data

Measured Streams

The analysis focused on naturally-occurring streams with a defined channel and regular annual flows. The analyzed streams included both named and unnamed streams and topographic lows. Stream segments with ephemeral flows, an indistinguishable channel, or existing protections under the Benton County Shoreline Master Program were excluded. Table 2 lists the streams that were included and excluded from the analysis.

Table 2: Included and Excluded Streams

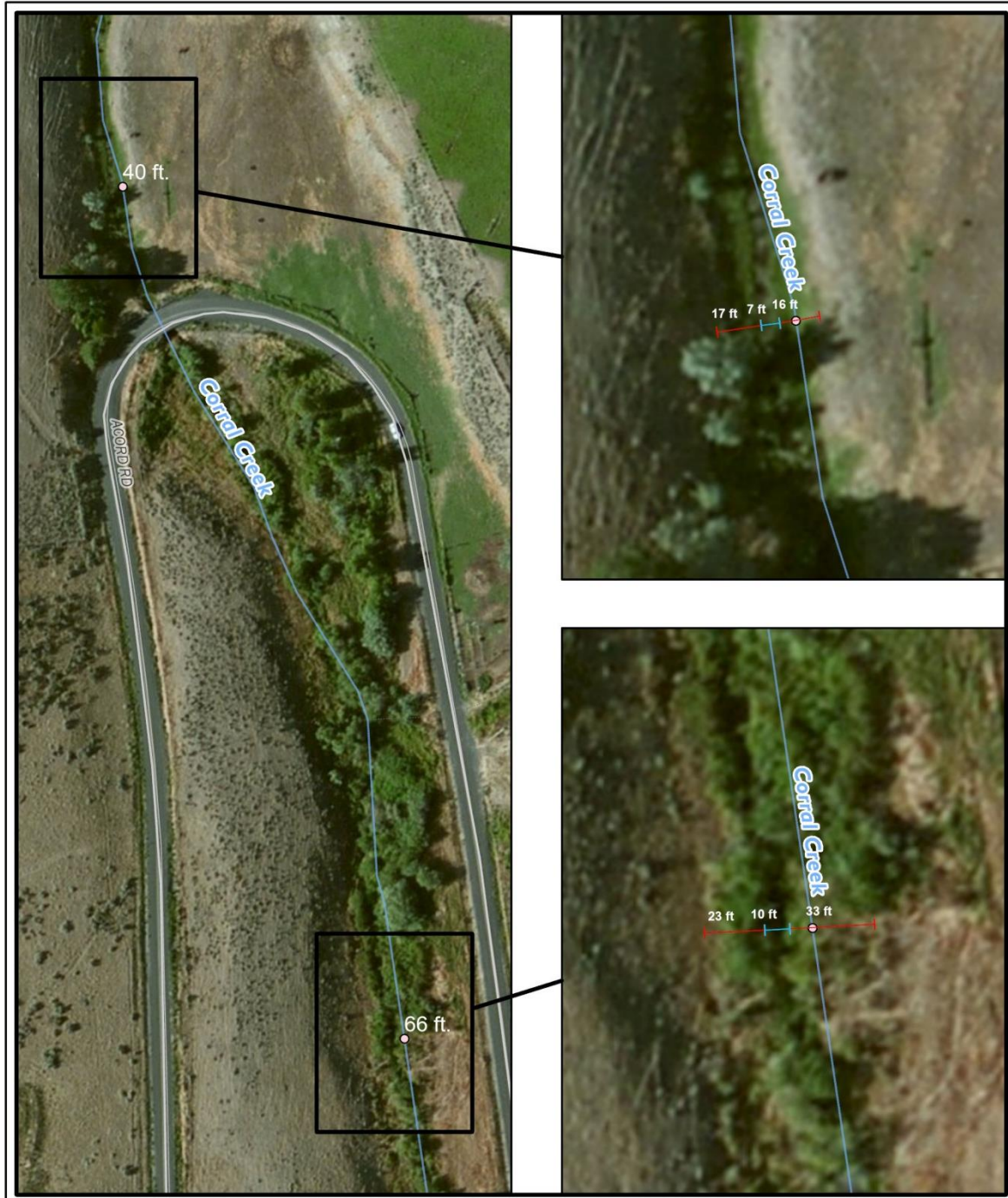
Type	Stream	Comments
Included Streams	CORRAL CREEK	3.5 MI. UPSTREAM FROM CONFLUENCE WITH YAKIMA R.
	EAST BRANCH GLADE CREEK	3.7 MI. UPSTREAM FROM CONFLUENCE WITH GLADE CK.
	GLADE CREEK	7.7 MI. UPSTREAM FROM CONFLUENCE WITH COLUMBIA R.
	SNIPES CREEK	3.9 MI. UPSTREAM FROM CONFLUENCE WITH YAKIMA R.
	SPRING CREEK	9.2 MI. UPSTREAM FROM CONFLUENCE WITH YAKIMA R.
	UNNAMED STREAM #1	2 MI. UPSTREAM FROM CONFLUENCE WITH YAKIMA R.

	UNNAMED STREAM #2	2 MI. UPSTREAM FROM OLD INLAND EMPIRE HWY
	UNNAMED STREAM #3	1.6 MI. UPSTREAM FROM CONFLUENCE WITH SNIPES CK.
	UNNAMED STREAM #4	1.5 MI. FROM KENNEWICK CITY LIMIT TO COLUMBIA R.
	UNNAMED STREAM #5	2.8 MI. UPSTREAM FROM GRIFFIN RD. AND N. RIVER RD.
	UNNAMED STREAM #6	2.5 MI. N. FROM PROSSER UGA BOUNDARY
	UNNAMED STREAM #7	3.5 MI. FROM PIONEER RD. TO HINZERLING RD.
	UNNAMED STREAM #8	2.1 MI. FROM COUNTY BOUNDARY AT HANKS RD. TO GRIFFIN RD.
	Included Topo. Lows	BING CANYON
DEAD CANYON		4 MI. UPSTREAM FROM JUNCTION OF SONOVA RD AND SR 14
FOURMILE CANYON		9.4 MI. UPSTREAM FROM SR 14
SWITZLER CANYON		2.5 MI. UPSTREAM FROM CONFLUENCE WITH COLUMBIA R.
Excluded Streams	COLD CREEK	PORTIONS OUTSIDE FEDERAL LANDS ARE EPHEMERAL
	COLUMBIA RIVER	SHORELINE JURISDICTION
	DRY CREEK	PORTIONS OUTSIDE FEDERAL LANDS ARE EPHEMERAL
	RATTLESNAKE CREEK	PORTIONS OUTSIDE FEDERAL LANDS ARE EPHEMERAL
	SULPHUR CREEK	PORTIONS OUTSIDE FEDERAL LANDS ARE EPHEMERAL
	YAKIMA RIVER	SHORELINE JURISDICTION
Excluded Topo. Lows	AMO CANYON	NO OBSERVABLE FLOWS OR DEFINED BED & BANK
	BADGER CANYON	NO OBSERVABLE FLOWS OR DEFINED BED & BANK
	BAXTER CANYON	NO OBSERVABLE FLOWS OR DEFINED BED & BANK
	BLACK CANYON	NO OBSERVABLE FLOWS OR DEFINED BED & BANK
	BOFER CANYON	NO OBSERVABLE FLOWS OR DEFINED BED & BANK
	CARTER CANYON	NO OBSERVABLE FLOWS OR DEFINED BED & BANK
	COYOTE CANYON	NO OBSERVABLE FLOWS OR DEFINED BED & BANK
	KELLY GULCH	NO OBSERVABLE FLOWS OR DEFINED BED & BANK
	MOORE CANYON	NO OBSERVABLE FLOWS OR DEFINED BED & BANK
	NINE CANYON	NO OBSERVABLE FLOWS OR DEFINED BED & BANK
	PROSPECT CANYON	NO OBSERVABLE FLOWS OR DEFINED BED & BANK
	RANKIN CANYON	NO OBSERVABLE FLOWS OR DEFINED BED & BANK
	SCOUTEN CANYON	NO OBSERVABLE FLOWS OR DEFINED BED & BANK
	SHEEP CANYON	NO OBSERVABLE FLOWS OR DEFINED BED & BANK
	SPRING GULCH	NO OBSERVABLE FLOWS OR DEFINED BED & BANK
	STRAUB CANYON	NO OBSERVABLE FLOWS OR DEFINED BED & BANK
	TAYLOR CANYON	NO OBSERVABLE FLOWS OR DEFINED BED & BANK
WEBER CANYON	NO OBSERVABLE FLOWS OR DEFINED BED & BANK	
ZINTEL CANYON	NO OBSERVABLE FLOWS OR DEFINED BED & BANK	

Buffer Measurement

Points were generated at 1,000 foot intervals along the included stream segments. At each point, the channel width, right and left bank vegetation widths, and vegetation type were recorded. Figure 1 illustrates a stream section with measurement points, and channel, right bank, and left bank measurements.

Figure 1: Stream Measurement Example



The analysis is not intended to provide exact buffer widths, but rather to typify average conditions throughout each stream section. Because buffer measurements are taken at specific points along a

continuous stream, there are variations in buffer width that are not captured. In many locations, there are wetlands adjacent to the stream, which increases the apparent width of riparian vegetation. Because wetlands receive separate protections under the Benton County regulations, some mapped wetlands adjacent to riparian buffers were excluded from the buffer measurements, as shown in Figure 2.

Figure 2: Riparian Buffer Measurement with Adjacent Wetlands



Field Verification

A field visit was conducted in April 2020 to verify the buffer measurement methodology at several publicly accessible sites. Actual stream and riparian buffer widths were measured with a tape and compared to widths calculated with aerial imagery. Riparian vegetation types measured in the field were cross referenced with those identified in aerial imagery to verify accuracy.



Corral Creek Channel and Riparian Vegetation – April 9th 2020.

Results

Riparian buffer characteristics were summarized for 29 stream segments. The average, minimum, and maximum values for each stream segment were calculated from the measurement points that fall along that segment. Overall, the measured streams had an average buffer width of 20 feet per side. The average stream channel width was 7 feet, and the average total riparian area width was 47 feet. Riparian buffer data for each stream segment is summarized in Table 3.

Table 3: Existing Riparian Buffer Conditions

Segment Name	Stream Segment ID #	Riparian / Stream Maximum Width	Riparian / Stream Minimum Width	Stream Average Width	Riparian / Stream Average Total Width	Riparian Average Width	Riparian Average Width Per Side	Majority Riparian Vegetation	Segment Description	Comments
CORRAL CREEK # 1	COR-1	114	48	7	75	69	34	TREES & SHRUBS	YAKIMA RIVER TO HIGHLAND EXTENSION RD	
CORRAL CREEK # 2	COR-2	126	41	9	90	81	41	TREES & SHRUBS	HIGHLAND EXTENSION RD TO ACORD RD	WETLANDS ADJACENT TO RIPARIAN AREA
CORRAL CREEK # 3	COR-3	121	26	7	74	67	33	TREES & SHRUBS	FROM ACORD RD 1 MI. UPSTREAM	SEASONAL FLOWS
EAST BRANCH GLADE CREEK	EBG-1	87	25	10	58	49	24	HERBACEOUS	3.7 MI UPSTREAM FROM CONFLUENCE W GLADE CK	HERBACEOUS BUFFER WITH FEW TREES, SEASONAL FLOW
GLADE CREEK #1	GLA-1	132	30	13	77	64	32	SHRUBS & HERBACEOUS	COLUMBIA R. TO E. BRANCH GLADE CK	ADJACENT WETLANDS WITH SEASONAL OPEN WATER
GLADE CREEK #2	GLA-2	68	30	8	50	42	21	SHRUBS & HERBACEOUS	2.5 MI. UPSTREAM FROM E. BRANCH CONFLUENCE	TERRACED RIPARIAN PLANTINGS THROUGH SECTION
SNIPES CREEK #1	SNI-1	72	29	10	43	33	16	TREES & SHRUBS	YAKIMA R. TO MCCREADIE RD	RURAL RESIDENTIAL DEVELOPMENT ADJACENT TO STREAM
SNIPES CREEK #2	SNI-2	102	33	12	61	49	25	TREES & SHRUBS	MCCREADIE RD TO HANKS RD	ADJACENT WETLANDS
SNIPES CREEK #3	SNI-3	74	48	11	58	47	24	TREES & SHRUBS	UPSTREAM 1/2 MILE FROM HANKS RD	
SPRING CREEK #1	SPR-1	47	33	15	40	26	13	HERBACEOUS	YAKIMA R. TO OLD INLAND EMPIRE HWY	RURAL RESIDENTIAL AREA, MOSTLY GRASS BUFFER
SPRING CREEK #2	SPR-2	33	9	10	21	11	5	HERBACEOUS	OLD INLAND EMPIRE HWY TO MCCREADIE RD	MODIFIED CHANNEL, MINIMAL NATURAL BUFFER
SPRING CREEK #3	SPR-3	58	11	5	32	27	14	HERBACEOUS	MCCREADIE RD TO HINZERLING RD	ADJACENT WETLANDS
SPRING CREEK #4	SPR-4	64	9	6	28	22	11	BARE/DEVELOPED	HINZERLING RD TO SNIPES RD	SECTIONS OF STRAIGHTENED CHANNEL WITH NO VEG.
UNNAMED PERENNIAL STREAM #1	UNS-1	115	18	3	53	50	25	TREES & SHRUBS	2 MILES UPSTREAM FROM CONFLUENCE WITH YAKIMA R.	UNNAMED PERENNIAL STREAM DEFINED BED AND BANK
UNNAMED PERENNIAL STREAM #2	UNS-2	72	30	3	53	50	25	TREES & SHRUBS	2 MILES UPSTREAM FROM OLD INLAND EMPIRE HWY	SEASONAL FLOW. DEFINED BED & BANK AND RIPARIAN VEG.
UNNAMED PERENNIAL STREAM #3	UNS-3	34	17	6	27	21	11	HERBACEOUS	UPSTREAM 1/2 MILE FROM CONFLUENCE W/ SNIPES CK	MOSTLY GRASS BUFFER WITH FEW TREES
UNNAMED PERENNIAL STREAM #4	UNS-4	34	25	8	36	28	14	TREES & SHRUBS	KENNEWICK CITY LIMIT E. TO COLUMBIA R.	MODIFIED CHANNEL. RESIDENTIAL AREA.
UNNAMED PERENNIAL STREAM #5.1	UNS-5.1	34	18	6	30	24	12	HERBACEOUS	NORTH RIVER RD TO OLD INLAND EMPIRE HWY	SEASONAL FLOWS
UNNAMED PERENNIAL STREAM #5.2	UNS-5.2	34	18	6	25	19	9	HERBACEOUS	OLD INLAND EMPIRE HWY TO IRRIGATION CANAL	MODIFIED CHANNEL WITH GRASS BUFFER.
UNNAMED PERENNIAL STREAM #6	UNS-6	34	11	4	25	21	11	HERBACEOUS	2.5 MI. N. FROM PROSSER UGA BOUNDARY	MODIFIED CHANNEL. GRASS BUFFER.
UNNAMED PERENNIAL STREAM #7.1	UNS-7.1	34	8	5	18	13	7	HERBACEOUS	PIONEER RD TO BUNN RD.	GRASS BUFFER
UNNAMED PERENNIAL STREAM #7.2	UNS-7.2	34	16	4	59	55	28	SHRUBS & HERBACEOUS	BUNN RD. TO HINZERLING RD.	SEASONAL FLOWS
UNNAMED PERENNIAL STREAM #8	UNS-8	34	22	4	34	30	15	HERBACEOUS	COUNTY BOUNDARY (HANKS RD), TO GRIFFIN RD	IN-CHANNEL IMPOUNDMENTS & ADAJACENT WETLANDS
BING CANYON	BIN-1	34	38	4	57	53	27	SHRUBS & HERBACEOUS	2.5 MI STARTING AT SR 14	SEASONAL FLOW
DEAD CANYON	DEA-1	34	39	7	58	52	26	SHRUBS & HERBACEOUS	JCT SONOVA RD & SR 14 UPSTREAM 4 MI.	SEASONAL FLOWS
FOURMILE CANYON #1	FOU-1	34	29	7	37	30	15	SHRUBS & HERBACEOUS	COLUMBIA RIVER TO SR-14	SEASONAL FLOWS
FOURMILE CANYON #2	FOU-2	34	26	6	48	42	21	TREES & SHRUBS	SR-14 TO PLYMOUTH RD	ADJACENT WETLANDS
FOURMILE CANYON #3	FOU-3	34	16	4	37	33	16	SHRUBS & HERBACEOUS	4 MI. UPSTREAM FROM PLYMOUTH RD	SEASONAL FLOWS
SWITZLER CANYON	SWI-1	34	39	4	66	62	31	SHRUBS & HERBACEOUS	2.5 MI. UPSTREAM FROM CONFLUENCE W. COLUMBIA R.	SEASONAL FLOWS

NOTES:
 THE FOLLOWING NAMED STREAMS WERE NOT MEASURED: COLD CREEK, DRY CREEK, RATTLESNAKE CREEK, AND SULPHUR CREEK. THESE STREAMS DID NOT HAVE VISIBLE FLOWS, RIPARIAN VEGETATION, OR A DEFINED CHANNEL IN THE APPLICABLE AREAS FOR THIS STUDY. THE COLUMBIA AND YAKIMA RIVERS WERE NOT INCLUDED BECAUSE THEY ARE ALREADY PROTECTED UNDER THE SHORELINE MASTER PROGRAM. OTHER UNNAMED STREAMS AND TOPOGRAPHIC LOWS WERE ALSO REVIEWED, BUT DID NOT HAVE MEASURABLE CHARACTERISTICS TO BE INCLUDED IN THE STUDY.