

## City of Walla Walla - Stream Buffer Analysis

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|---------------|------------------------------------------------------------------------|
| Date:         | July 1, 2026                                                           |
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| Project Name: | Walla Walla CAO Update – Stream GIS Analysis                           |
| Facet Number: | 2507.0393.01                                                           |

## 1. Introduction

This technical memorandum summarizes the results of a spatial analysis conducted to inform the City of Walla Walla’s evaluation of potential riparian management zone (RMZ) modifications as part of the critical areas ordinance update. The analysis compares the City’s existing stream buffer framework with a dryland RMZ scenario based on current guidance from the Washington Department of Fish and Wildlife (WDFW). The evaluation also considers the extent of impervious surface and functionally disconnected buffer areas within each scenario to support a planning-level understanding of potential regulatory and ecological implications.

In 2020, WDFW published a synthesis of the best available science for riparian ecosystems (Quinn, Wilhere, and Krueger 2020), followed by management recommendations that support a shift from regulating stream buffers to regulating RMZs (Rentz et al. 2020). Although RMZs are conceptually and practically similar to stream buffers, they are intended to protect the broader ecological functions provided by riparian ecosystems, including water quality protection, stream shading, habitat connectivity, pollutant removal, bank stability, and other functions beyond direct stream habitat.

While much of WDFW’s RMZ framework is based on site potential tree height (SPTH), dryland ecosystems, including those in the City of Walla Walla, are addressed through a simplified dryland RMZ framework. Under that framework, open streams are assigned a minimum 100-foot water quality buffer, which may be expanded where the surrounding riparian vegetative community extends farther. For this analysis, piped stream segments were assumed to have no buffer, and Shorelines of the State were excluded because they are regulated under the City’s Shoreline Master Program.

## 2. Methods

### 2.1 DATA ACQUISITION

To compare the recommended RMZs with existing stream buffers, available GIS data were processed to create stream, buffer, and RMZ layers for each scenario within the City of Walla Walla. The following data types were collected and processed for this analysis.

Table 1. Data, sources, and purposes in this analysis

| <b>Data Type</b>                                     | <b>Data Source</b>                                                | <b>Purpose</b>                                                                                                                                                                                                                                                    |
|------------------------------------------------------|-------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Streams Shapes</b><br><i>Received 2026</i>        | City of Walla Walla Streams Layer, including intermittent streams | Stream centerlines used for buffer scenarios                                                                                                                                                                                                                      |
| <b>Stream Typing</b><br><i>Received 2026</i>         | City of Walla Walla CAO                                           | Buffers distances determined by stream-specific ordinances                                                                                                                                                                                                        |
| <b>Riparian-related Data</b><br><i>Received 2026</i> | City of Walla Walla (USGS and USFW)                               | Used to create existing riparian areas. NHD Waterbody, NHD Major Areas, Washington Riparian Areas, and Washington Wetlands were sent by the City of Walla Walla, sourced from the USGS National Hydrography dataset and from the USFW National Wetlands Inventory |
| <b>City Limits</b><br><i>Received 2026</i>           | City of Walla Walla                                               | Used as a study area                                                                                                                                                                                                                                              |
| <b>Impervious Surface</b><br><i>Received 2026</i>    | City of Walla Walla                                               | Used to evaluate development implications of potential RMZs                                                                                                                                                                                                       |

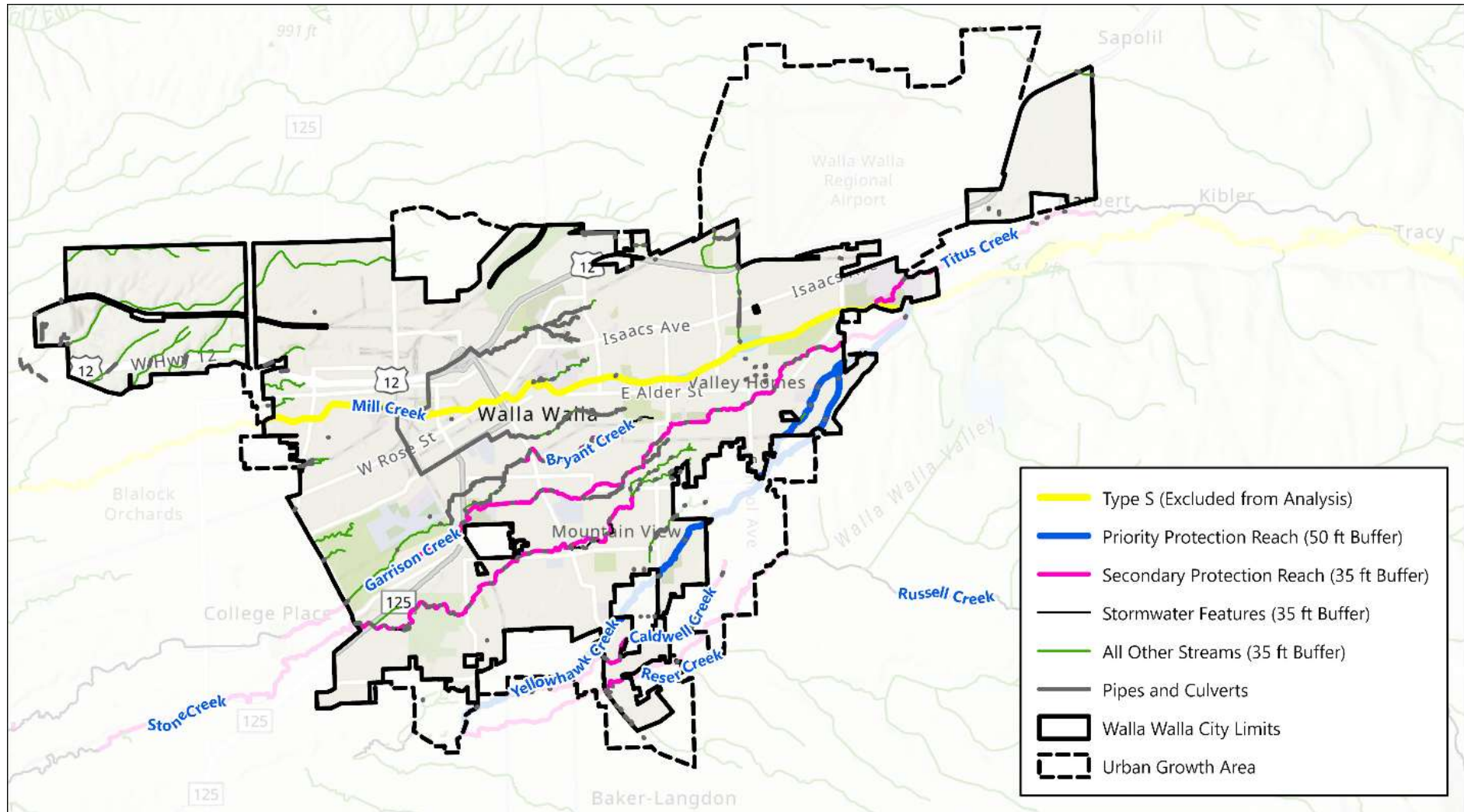


Figure 1. Walla Walla streams mapped by existing CAO criteria

## 2.2 ALTERNATIVE SCENARIOS

Two alternative scenarios were evaluated which include (1) the current regulatory environment, and (2) dryland RMZs aligning with recommendations by WDFW (Rentz et al. 2020).

Under the current regulatory framework in Walla Walla Municipal Code (WWMC) 21.04, Critical Areas, streams are assigned fixed-width buffers based on the established buffer width for each defined reach. The current framework includes 50-foot buffers for designated *priority protection reaches*, 35-foot buffers for other designated streams (referred to as *secondary protection reaches* for the purpose of this analysis), and 35-foot buffers for all other regulated streams. Piped stream segments are not subject to buffer requirements.

WDFW's dryland ecosystem RMZ recommendations establish a 100-foot water quality buffer, which may be expanded to include the full extent of the surrounding riparian vegetative community. Based on the average riparian vegetation widths identified in WWMC 21.04.650, none of the evaluated reaches exceeds the 100-foot RMZ; however, localized areas within the city may warrant wider buffers where riparian vegetation extends beyond 100 feet (Table 2). For purposes of this analysis, piped stream segments are assumed to have no buffer.

**Table 2.** Walla Walla streams and current buffers, and average width of riparian vegetation according to WWMC 21.04.650.

| Stream                                                                             | Existing Buffer (ft)                         | Existing Riparian Average from City (ft) |
|------------------------------------------------------------------------------------|----------------------------------------------|------------------------------------------|
| <b>Mill Creek</b><br><i>From Gose Street to Bennington Lake dam diversion</i>      | SMP managed stream, not included in analyses | Not applicable                           |
| <b>Yellowhawk Creek</b><br><i>Russell Creek to Mill Creek</i>                      | 50                                           | 31                                       |
| <b>Russell Creek</b><br><i>Dipping Road to Yellowhawk Creek</i>                    | 35                                           | 21                                       |
| <b>Reser Creek</b><br><i>Wilbur Avenue to Russell Creek</i>                        | 35                                           | 23                                       |
| <b>Caldwell Creek</b><br><i>Headwaters to Yellowhawk Creek</i>                     | 35                                           | None listed                              |
| <b>Stone Creek</b><br><i>Headwaters to Teal Street</i>                             | 35                                           | 20                                       |
| <b>Garrison Creek</b><br><i>Yellowhawk Creek to Lions Park (excluding wetland)</i> | 35                                           | 24                                       |
| <b>Bryant Creek</b><br><i>Sprague Avenue to Fort Walla Walla Park</i>              | 35                                           | 14                                       |

| Stream                                                                          | Existing Buffer (ft) | Existing Riparian Average from City (ft) |
|---------------------------------------------------------------------------------|----------------------|------------------------------------------|
| <b>Titus Creek</b><br><i>Blackberry Lane to Mill Creek by Community College</i> | 35                   | 25                                       |
| <b>All Other Creeks</b><br><i>Within City Limits/UGA</i>                        | 35                   | Not listed                               |
| <b>All Piped Stream Segments</b><br><i>Applies to all creeks</i>                | 0                    | Not applicable                           |

## 2.3 IMPERVIOUS SURFACE AND DISCONNECTED BUFFERS

In addition to generalized buffer mapping and summary statistics, spatial analysis was conducted to characterize land cover patterns under both stream regulation scenarios. Because development-related impacts are a primary consideration, the extent of impervious surface area was quantified within each buffer scenario, along with the proportion of areas functionally disconnected by impervious cover.

To more accurately represent functionally disconnected buffers surrounding development areas, a buffer-and-dissolve polygon aggregation technique was also applied. This approach consolidates developed buffer areas in close proximity and more effectively represents areas of functional isolation that are not impervious. A visualization of this technique is shown in Figure 2. This city-wide analysis is for estimating purposes only and is intended to support review of riparian buffer regulations.



Figure 2. Visualization showing a sample area along Garrison Creek with impervious surface cover in black, and additional functionally disconnected buffers in blue.

## 2.4 ASSUMPTIONS AND LIMITATIONS

The following assumptions and limitations apply to the spatial analysis and should be considered when interpreting the results:

1. Stream buffers were generated from mapped stream centerlines rather than the ordinary high water mark because centerline data were the available spatial data source.
2. Shorelines of the State are excluded from this analysis because they are regulated under the City's Shoreline Master Program.
3. Streams of unknown jurisdictional status were included.
4. The impervious surface and functionally disconnected buffer analyses are considered reliable for broad-scale planning purposes but should not be used for site-level determinations.
5. The analysis is limited by the accuracy of the underlying datasets. Although dataset limitations may compound across analytical steps, the source data are considered generally reliable for broad-scale planning purposes.

## 3. Results

The City of Walla Walla contains 43.2 stream miles, of which 2.4 miles (5.7%) currently have a 50-foot buffer, 27.2 miles (63.0%) have a 35-foot buffer, and 13.5 miles (31.4%) are piped and not associated with a regulated buffer. Under the dryland RMZ scenario, all 29.7 miles (68.6%) of non-piped streams would be assigned a minimum 100-foot buffer.

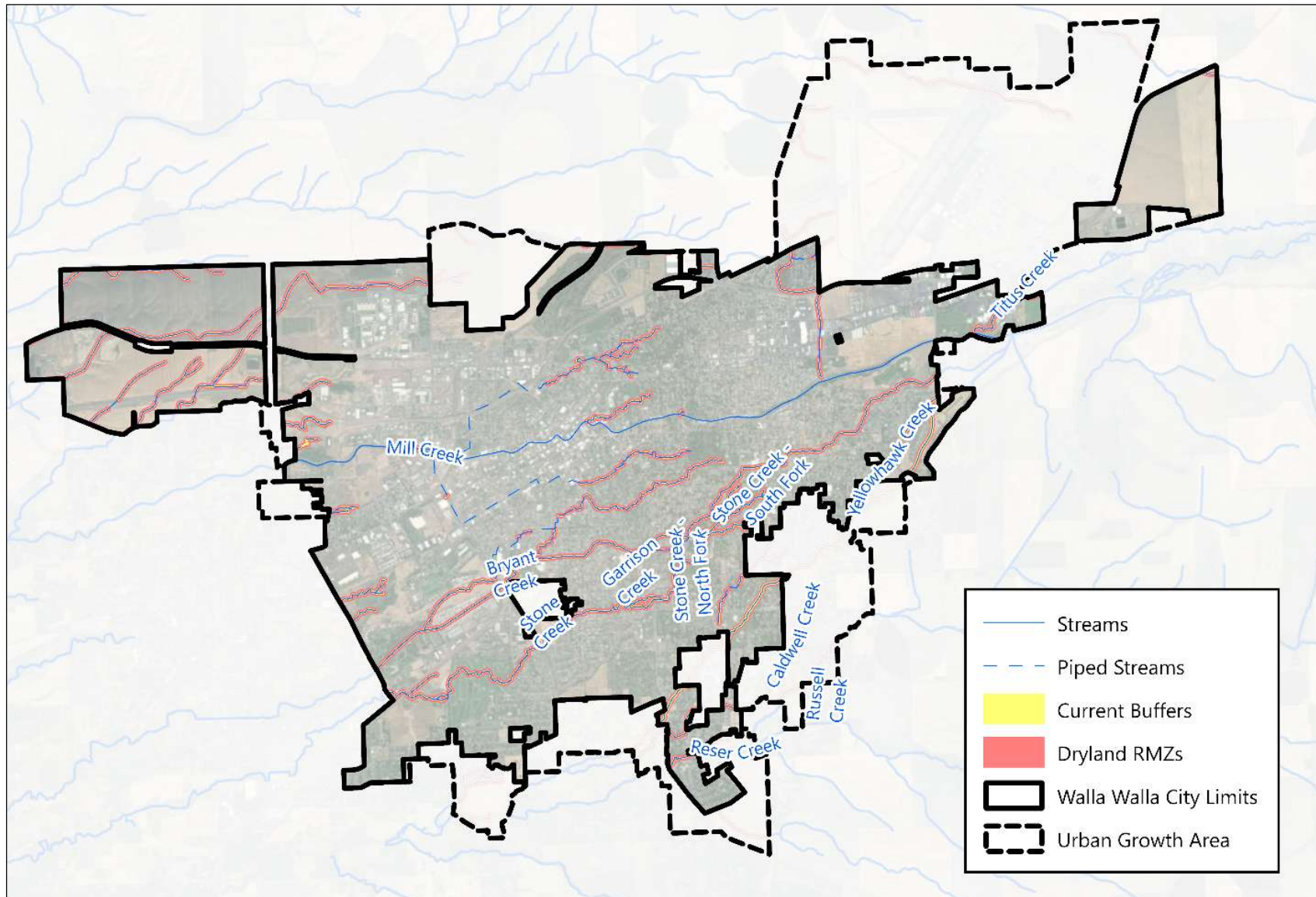
Existing impervious surfaces account for approximately 12.4% of the current buffer area, with an additional 3.5% classified as functionally disconnected, for a combined total of 16%. The remaining 84.0% of the buffer area is vegetated, representing a range of conditions from intact riparian forest to managed landscapes such as open fields and maintained lawns.

The total buffer extent is projected to increase from 268.8 acres to 757.4 acres under the dryland RMZ scenario, representing approximately 2.1% and 5.8% of the total city area, respectively. Within the expanded buffer, impervious surfaces are estimated to comprise 24.4% of the total area, with an additional 6.0% identified as functionally disconnected (30.4% combined). Although newly incorporated buffer areas are associated with a higher proportion of impervious cover and functional disconnection, approximately 69.6% of the total buffer area would remain vegetated, providing important ecological functions for stream and riparian systems. See summary in Table 3 below.

**Table 3.** Summary of areal calculations for stream buffers, impervious surfaces, and functionally disconnected buffer area.

| Category                                       | Current Buffers (ac) | Dryland RMZs (ac) |
|------------------------------------------------|----------------------|-------------------|
| Total Area                                     | 268.8                | 757.4             |
| Impervious Surface                             | 33.4 (12.4%)         | 184.9 (24.4%)     |
| Total Area – Functionally Disconnected Buffers | 42.9 (16.0%)         | 230.4 (30.4%)     |
| % of vegetated buffer area <sup>1</sup>        | 84.0%                | 69.6%             |

1 Vegetated areas in this GIS analysis may include a range of conditions from relatively intact riparian corridors to managed landscapes (e.g. lawns, parks) and other open spaces.



**Figure 3.** Current buffers and potential dryland RMZs in Walla Walla.

## 4. Discussion

This analysis indicates that applying WDFW's dryland RMZ recommendations would increase the total area subject to riparian protection within the City of Walla Walla. Under the current regulatory framework, most non-piped streams are regulated with 35-foot buffers, with a smaller proportion regulated with 50-foot buffers. In contrast, the dryland RMZ scenario applies a minimum 100-foot water quality buffer to all non-piped stream segments. This change would increase the total mapped buffer area from approximately 268.8 acres to approximately 757.4 acres, increasing the proportion of the city and UGA within mapped stream buffers from approximately 2.1% to 5.8%.

The impervious surface results also indicate that the dryland RMZ scenario would cover a greater proportion of developed or altered land than the current buffer scenario. Under existing buffers, impervious surfaces and functionally disconnected areas together account for approximately 16.0% of the mapped buffer area. Under the dryland RMZ scenario, the combined impervious and functionally disconnected area increases to approximately 30.4%. This pattern is expected in an urban setting because wider buffers extend farther into developed parcels, road corridors, and other land uses that may not currently provide riparian function.

Although the expanded RMZ scenario includes a higher proportion of impervious and functionally disconnected land, most of the land cover within potential riparian protection zones remains vegetated. Approximately 69.6% of the dryland RMZ is not impervious or functionally disconnected, and remains primarily vegetated. These vegetated areas may include a range of conditions, from relatively intact riparian corridors to managed landscapes such as lawns, parks, fields, and other open spaces. It may also include some areas of non-vegetated land that were not captured in the impervious surface data set, or landcover which is both non-impervious and non-vegetated. They may also include some non-vegetated areas not captured by the impervious surface dataset.

While vegetated areas vary in their ecological condition and functional value, they represent locations where existing riparian functions may be retained and where restoration, enhancement, or redevelopment requirements could improve long-term riparian function. For comparison, an estimated 84.0% of the area within current buffers is vegetated, whereas the newly added buffer area is estimated to be 62.6% vegetated.

The following WDFW riparian management recommendations should also be considered for implementation (Rentz et al. 2020):

- Maintaining and improving functions through regulatory and voluntary means,
- Increased regulations for clearing and grading activities within RMZs,
- Expanding Habitat Management requirements
- Implementing strict exemption requirements.
- Identifying and prioritizing restoration,
- Maintaining and improving riparian connections, and
- Applying stormwater management.

Additional strategies that the City of Walla Walla can consider to improve protection of riparian areas

are described in the WDFW Riparian Management Zone Checklist for Critical Areas Ordinances<sup>1</sup>, which is a voluntary list of considerations in addition to the Commerce CAO Checklist. These strategies include:

- 1. Restore or Enhance Riparian Vegetation:** For riparian/stream buffer areas to provide intended functions they are presumed to be densely vegetated with native vegetation typical of our ecoregion. Restoration actions recommended by WDFW include protecting existing habitat, connecting fragmented habitats, restoring natural processes, and creating or enhancing habitat. In some cases, buffer averaging may require enhancement measures to address degraded conditions.
- 2. Improve Water Quality:** WDFW recommends a minimum 100-foot buffer width to provide for adequate pollutant removal to protect water quality as described earlier in this memo (Quinn, Wilhere, and Krueger 2020; Rentz et al. 2020). Water quality can also be supported by applying stormwater regulations and incentivizing low impact development and/or Salmon-Safe project certifications, where appropriate.
- 3. Mapping Restoration Areas:** The City could consider mapping areas to pinpoint the best sites to restore considering connectivity and adjacency to other mapped Priority Habitats.
- 4. Incentives to Daylight Streams:** To support restoration, the City may choose to provide regulations that specifically address daylighting streams at sites with existing legally established nonconforming uses. For stream daylighting or enhancement projects, this may include riparian vegetation improvements, increasing off-channel habitat, reversing channel incision, improving channel morphology, improving streambank stability, and increased quantity of large woody debris (Rentz et al. 2020).
- 5. Reinforcing Mitigation Sequencing:** To reduce unnecessary habitat impacts within riparian ecosystems, it is recommended to provide improved regulations for mitigation sequencing. As described in WAC 365-196-380, "Avoidance is the most effective way to protect critical areas". Applicants should be required to demonstrate that mitigation sequencing was used in each project proposal that may impact habitat functions or values, including that avoidance was considered.
- 6. Stricter Clearing and Grading Requirements:** It is recommended that the City limit clearing, filling, and grading activities within riparian areas, unless they are directly related to restoration, as these activities can negatively impact riparian ecosystems (Rentz et al. 2020). This includes considering restricting placement of on-site septic systems within 100' of riparian areas. It is also recommended that the City incorporate specific habitat assessment requirements as suggested in Riparian Ecosystems, Volume 2: Management Recommendations (Rentz et al. 2020).
- 7. Expanded Habitat Management Plan (HMP) Requirements:** WDFW recommends that when an activity is proposed in a RMZ or could affect riparian or aquatic functions, a Habitat Management Plan (HMP) should be required. For consistency with the guidance in WDFW

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<sup>1</sup> WDFW RMZ Checklist for Critical Areas Ordinances, August 2023: [rmzcaochecklist.pdf](https://www.wdfw.wa.gov/publications/0000/0000/0000/rmzcaochecklist.pdf)

Riparian Ecosystems, Volume 2: Management Recommendations, the Habitat Management Plan requirements could be expanded to include the following: Measurable standards and expectations to monitor compliance and defined triggers for requiring more actions, i.e., performance standards. Examples of measurable standards could include extent of vegetative cover, composition of riparian vegetation and maximum invasive plant cover. The Habitat Management Plan is recommended to also identify the frequency of visits to monitor the site and specify who is responsible for preparing, reviewing, and submitting monitoring reports.

As the City of Walla Walla considers this assessment, we recognize stream regulations will be reviewed from an implementation feasibility perspective and are balanced with other Growth Management Act (GMA) requirements. Pursuant to WAC 365-195-915, when nonscientific information, including legal, social, cultural, economic, or political considerations, is used to support critical area policies or regulations that depart from recommendations based on the best available science, the record must: (1) identify the nonscientific information relied upon to justify the departure; (2) explain the rationale for deviating from science-based recommendations; and (3) identify any potential risks to climate resiliency and to the functions and values of the affected critical area(s), along with any additional measures adopted to mitigate such risks.

## 5. References

- Quinn, T., G.F. Wilhere, and K.L. Krueger. 2020. *"Riparian Ecosystems, Volume 1: Science Synthesis and Management Implications."* Olympia: Washington Department of Fish and Wildlife.
- Rentz, T, Amy Windrope, Terra Rentz, Keith Folkerts, and Jeff Azerrad. 2020. *"Riparian Ecosystems, Volume 2: Management Recommendations."* Olympia, Washington: Washington Department of Fish and Wildlife.
- Washington Department of Fish and Wildlife (WDFW). 2023 (Amended August 2023). Riparian Management Zone Checklist for Critical Area Ordinances, A Technical Assistance Tool. (RMZ Checklist). <https://wdfw.wa.gov/sites/default/files/2023-08/rmr-cao-checklistaddendum.pdf>.