Spring Flat Creek

Straight to Implementation Strategy

Internal Workplan

By

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For the

Water Quality Program

Washington State Department of Ecology

Eastern Regional Office

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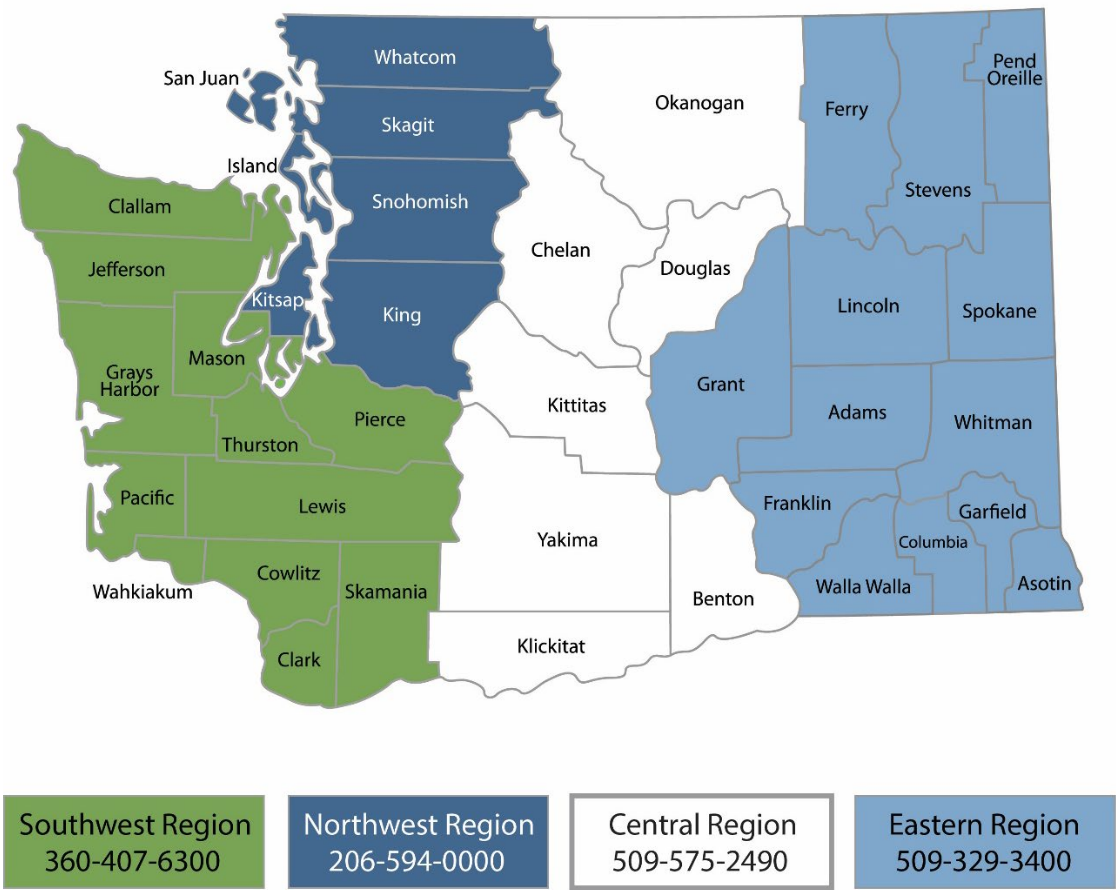

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Overview

Section 303(d) of the Federal Clean Water Act (CWA) requires states identify waters within their boundaries that are not meeting state water quality standards. The U.S. Environmental Protection Agency directs states to set priorities for cleaning up 303(d) listed waters and to establish a water cleanup plan to address the impairments. Water quality monitoring has identified reaches of the Spring Flat Creek Watershed that do not meet state water quality standards for temperature (category 5). Low dissolved oxygen (DO), and high pH are also a concern (category 2).

Monitoring efforts since the most recent assessment indicate DO and pH concerns are worsening and will likely need to be addressed. Therefore, this project is being designed to address temperature, DO, and pH impairments as well as any future listings for these parameters within this watershed. This plan identifies pollution sources and presents associated best management practices to address the impairments. All photos within this report were taken in March 2022 in the Spring Flat Creek Watershed.

Introduction

Water quality standards

The Department of Ecology is responsible for establishing water quality standards for surface waters in Washington. The water quality standards are found in Washington Administration Code (WAC) Chapter 173-201A. The standards include numeric and narrative criteria as well as designate beneficial uses for different water bodies. The standards also include an anti-degradation policy that requires the protection and maintenance of existing uses and protection of water quality of a higher quality than required by the numeric criteria.

All surface waters in the state include a designated aquatic life use. Based on this use, each water body is assigned numeric criteria to ensure the designated life use is protected. Spring Flat Creek does not appear in the WAC 173-201A table with specific beneficial uses identified. Therefore, the default criteria are applied. Those criteria include salmonid spawning, rearing, and migration; primary contact recreation; domestic, industrial, and agricultural water supply; stock watering; wildlife habitat; harvesting; commerce and navigation; boating; and aesthetic values. Standards for Spring Flat Creek's designated aquatic life use and associated parameters of concern can be found below in Table 1.

Table 1. Standards for Spring Flat Creek's designated aquatic life use and associated parameters of concern.

Parameter	Aquatic Life Use	Measurement	Numeric Criteria
Temperature	Salmonid Spawning, Rearing, and Migration	Highest 7-DADMax Degrees C	17.5 Degrees C
Dissolved Oxygen	Salmonid Spawning, Rearing, and Migration	Lowest 1-Day Minimum Milligrams/Liter	8.0 mg/L
pH	Salmonid Spawning, Rearing, and Migration	Negative logarithm of the hydrogen ion concentration	pH shall be within the range of 6.5 to 8.5 with a human-caused variation within the above range of less than 0.5 units.

Spring Flat Creek contains one category 5 listing for temperature, two category 2 listings for pH and dissolved oxygen (DO), and one category 4a listing for fecal coliform bacteria. Additional monitoring data recently collected by the Palouse Conservation District (PCD) is currently in review to be included in the state's future water quality assessment. Preliminary analysis suggests additional listings for all three parameters are likely. This STI's purpose is to address the category 5 and category 2 listings in the watershed to meet water quality standards for temperature, pH, and dissolved oxygen. The listings addressed by this STI are shown in Table 2, however, the goal of this STI is to address all future listings for these parameters as the actions in this plan will be applied to the entire watershed.

Table 2. Category 5 and Category 2 listings for Spring Flat Creek

WATERBODY	PARAMETER	CATEGORY	LISTING ID
Spring Flat Creek	TEMPERATURE	5	72949
Spring Flat Creek	pH	2	70800
Spring Flat Creek	DISSOLVED OXYGEN	2	77724

STI Determination

Total Maximum Daily Loads (TMDLs) are required for all waterbodies that do not meet water quality standards. A TMDL is a calculation of the maximum amount of a pollutant allowed to enter a waterbody so that the waterbody will meet and continue to meet water quality standards for a particular pollutant. TMDL studies analyze water quality problems, establish quantitative pollutant load reduction targets as well as allocations to point and nonpoint sources, and outline actions to address pollution. Unfortunately, developing TMDLs can be long, labor-intensive efforts that are expensive to produce. Furthermore, TMDLs don't necessarily lead quickly to the on-the-ground work needed to clean up the water, as they are not self-implementing. The purpose of a straight-to-implementation (STI) effort is to get to cleaner water faster. STIs look to identify sources of pollution and implement the specific actions known to protect surface water from each pollution source. If standards are not achieved through the STI approach, the waterbody will be reprioritized for TMDL development. While the STI is being implemented, the requirement to develop a TMDL remains. The goal of the STI is to implement a program and actions that will achieve standards and allow us to move the impaired segment to category 1.

All Eastern Region Category 5 polluted waterbodies were reviewed to determine which were suitable to address using the STI approach in advance of developing a TMDL. Staff developed criteria to determine whether to pursue implementing an STI. An STI is considered an appropriate approach if:

1. Water quality impacts understood – Ecology is familiar with the watershed and understands the types of land-uses and how those are affecting the pollution problem.
2. Relatively small and simple – The watershed is small enough to be manageable under a 10-year implementation approach and the pollution sources simple enough that generally well known BMPs are the primary implementation tools.
3. Nonpoint pollution – The pollution is nonpoint source, such as agricultural or non-regulated stormwater run-off. The watershed does not include permitted facilities that would require a TMDL waste load allocation.
4. Best management practices known – The fixes to the pollution problems are well-known. Ecology can be confident standards will be met by implementing specific practices to address the sources of pollution.
5. Strong partnerships in the watershed – Ecology has good relationships with local governments, such as conservation districts and Natural Resources Conservation Service (NRCS) offices. Furthermore, these partners express a willingness to implement fixes necessary to comply with the Water Pollution Control Act.
6. Progress being made – Some of the implementation work has already been completed and momentum exists to continue that work.

7. Funding availability – Funding is available to help implement the BMPs necessary to meet standards.
8. Ecology presence in the watershed – Ecology is working in the watershed and has developed the relationships needed to get the implementation completed. Ecology staff is also willing and able to use regulatory enforcement when necessary to achieve compliance with water quality laws.

9 Key Elements

An STI strategy is recommended for Spring Flat Creek because it: 1) currently fails water quality standards for temperature and continues to have conditions associated with other non-point pollution problems, and 2) meets the aforementioned STI criteria. The work plan that follows describes the water quality issues in the watershed and how they will be addressed. It also provides the details needed to satisfy Ecology's STI guidance, which incorporates the Environmental Protection Agency's nine key elements of a watershed plan. An STI work plan includes:

1. Causes and sources of pollution
2. Description of the nonpoint source best management practices (BMPs)
3. Estimated load reductions
4. Amounts of technical and financial assistance needed
5. Outreach and education
6. Project implementation schedule
7. Measurable milestones
8. Progress indicators
9. Monitoring component

This plan describes the riparian buffers and associated best management practices (BMPs) to eliminate non-point pollution from different land use types. It provides goals for shrub and tree vegetated buffers and describes the partners and funding sources necessary to accomplish those goals. It also includes information about how the effectiveness of this plan will be evaluated.

Watershed Description

Figure 1. Spring Flat Creek Watershed location

The Spring Flat Creek Watershed is a tributary to the South Fork Palouse River, located in southeast Washington state (Figure 1), in Whitman County. Land use within the Spring Flat Creek Watershed is dominated by dryland agriculture and rangeland. Spring Flat Creek drains approximately 13,200 acres of primarily dryland agriculture and rangeland before discharging into the South Fork Palouse River at its confluence (Figure 3) within the city limits of Colfax, Washington. Colfax (population about 3,000) is the only town in the Spring Flat Creek Watershed, and Spring Flat Creek only flows through a small portion on the south side of town. According to the USGS's National Hydrography Dataset (NHD) there are approximately 63.7 miles of stream within the watershed.

Figure 2. Spring Flat Creek confluence with SF Palouse River (Left); Spring Flat Creek flowing through the town of Colfax in an artificial concrete flood control channel (right)

Spring Flat Creek Watershed has a semi-arid climate. Annual precipitation in the town of Colfax, WA is approximately 19 inches. Precipitation peaks during early winter and falls primarily as snow. Summer precipitation is typically less than an inch per month, with July being the driest month averaging 0.71 inches. Summer precipitation typically falls during intermittent thunderstorms. Summer daily maximum air temperatures can range from mid-70s (°F) to the mid-90s (around 21°C to 35°C) and occasionally over 100°F (37.8°C).

Mainstem Spring Flat Creek generally runs south to north parallel to State Route 195, in some sections doubling as the roadside ditch. Redirecting the stream into roadside ditches and/or straightening the stream channel is common throughout the watershed, to make additional acres available for crop production. The last approximately 2,200 feet of Spring Flat Creek main stem flow through an artificial concrete flood control channel (Figure 2).

Causes and Sources of Pollution

The Spring Flat Creek Watershed has no permitted point-source discharges. All violations of water quality standards are the result of land uses that cause nonpoint pollution. Nonpoint source pollution is pollution which enters waters of the state from:

- Runoff (typically rainfall and snow melt washing pollutants from the land into rivers, streams, lakes, oceans, and underground aquifers)
- Direct deposition of pollutants into state waters
- Habitat alteration and hydromodification (the alteration of the natural flow of water across a landscape, including channel modification or channelization)
- Atmospheric deposition

Land use is strongly correlated to nonpoint pollution. Therefore, to manage nonpoint source (NPS) pollution, we must focus on land use activities. The major sources of nonpoint pollution can be divided into the following categories:

Table 3. Categories of nonpoint pollution

Categories	Associated Land Uses
Agriculture	Livestock feeding and grazing, crop production, non-commercial agriculture
Atmospheric Deposition	Emissions from various sources, wind-borne erosion
Forest Practices	Road construction and maintenance, harvesting, chemical applications
Habitat Alteration/ Hydromodification	Filling of wetlands and alteration of riparian areas, shoreline development, stream channelization, dikes, dredging, riprap, and dams
Recreation	Marinas and boats, off-road vehicles
Urban/Suburban Areas	Stormwater runoff, on-site sewage systems, hazardous materials, construction and maintenance of roads and bridges, residential use of fertilizers and pesticides

The poor riparian condition documented consistently during annual watershed evaluations is highly correlated with non-point pollution problems in Spring Flat Creek. Riparian areas are the land next to waterways, such as streams, lakes, and rivers. While riparian areas make up only a small portion of land in a watershed, they are critical in protecting water quality. Riparian ecosystem functions include:

- Regulating the flow of surface runoff generated from the uplands into the riparian area
- Capturing, retaining and/or transforming pollutants in the flow of surface and subsurface water
- Inhibiting stream bank erosion
- Providing stream shading (i.e., to prevent temperature pollution)
- Providing a supply of organic materials (e.g., wood and leaf litter) to streams and riparian areas
- Providing habitat for fish, mammals, birds, amphibians, reptiles, insects,

macroinvertebrates, etc.
- Providing riparian microclimate and hyporheic zone protection

Riparian Land Use Assessment Results

A riparian land use assessment was completed for the Spring Flat Creek Watershed. We analyzed the area within 35-feet of all National Hydrography Dataset (NHD) Spring Flat Creek waterways – those areas were then categorized by land use. Land use categorizations for the riparian assessment included: dryland crop production, livestock feeding/pasture/rangeland, perennial grasses, impervious surfaces, residential, and intact riparian. Once land uses were categorized, the acres were quantified for each land use (Figure 3). Results of the riparian land use assessment are below in Table 4.

Please note, 35-foot buffers were used for in this exercise merely for simplicity in determining the approximate land uses in riparian areas to guide implementation efforts. 35-foot buffers are not the recommended buffer widths. Please refer to the Riparian Management Zone (RMZ) and Buffer Width Recommendations section on page 37 for buffer width recommendations. After the assessment was completed, land use estimates for dryland crop production and livestock feeding, pasture, and grazing were expanded relative to their minimum buffer width recommendations for a more accurate representation. Although this exercise included some ground truthing, the majority of waterways were primarily mapped using the digitally available NHD layer and National Agriculture Imagery Program (NAIP) aerial imagery; therefore, on-the-ground locations of streams may differ, and all BMP recommendations should be developed from in-person field observations.

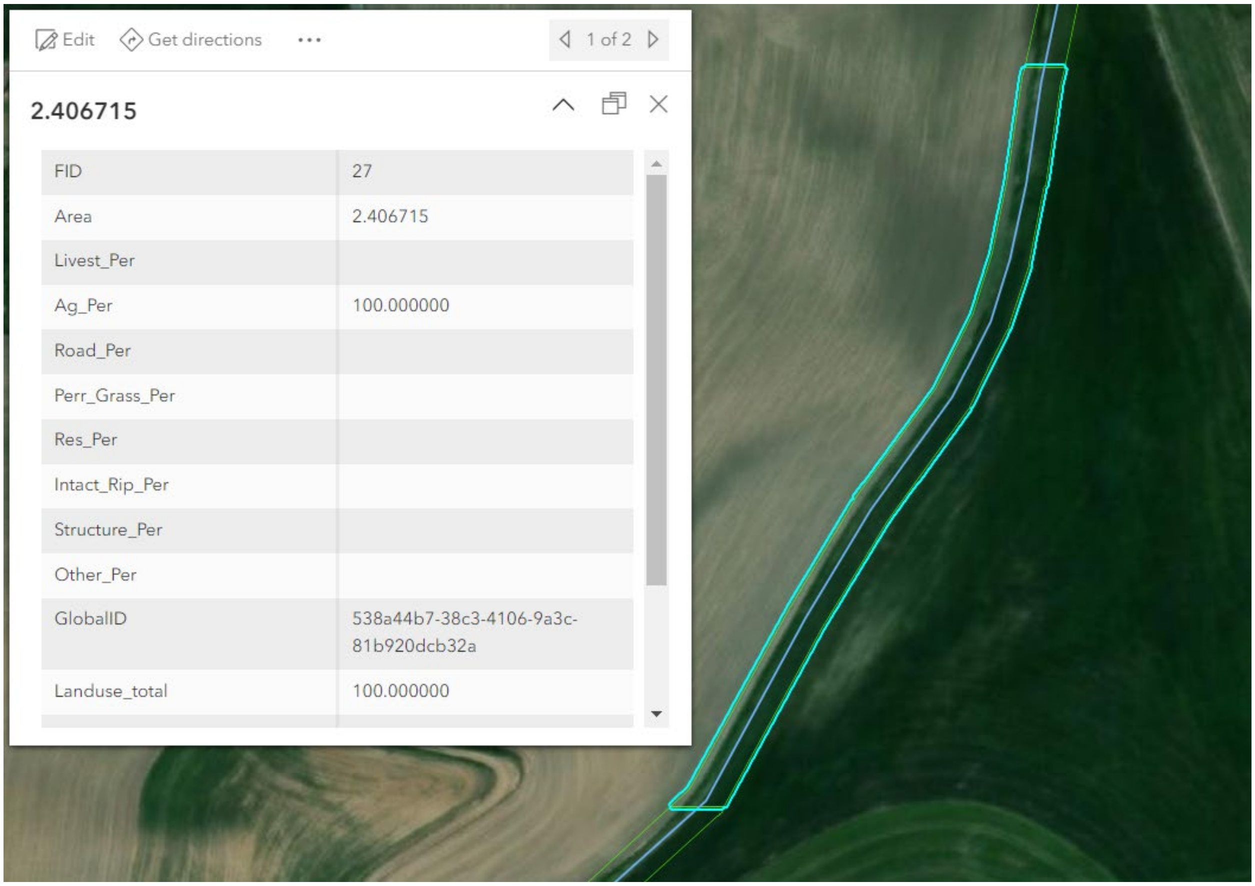

Figure 3. Image showing generated buffer along Spring Flat Creek - attribute table showing acreage of highlighted buffer section with land use type and acreage.

Table 4. Land use categorizations and associated acres and percentage in Spring Flat Creek riparian areas.

Land use Category	Acres	Percentage
Dryland Crop Production	345.36	66%
Livestock Feeding, Pasture & Grazing	88.13	17%
Perennial Grasses	46.94	9%
Impervious Surfaces	33.90	6%
Residential	4.37	1%
Intact Riparian	4.36	1%
Total	**523.06**	**100%**

Ecology has concluded the category 5 and category 2 listings are primarily due to:

- The lack of low soil disturbance tillage practices (direct seed and no-till) in upland crop production areas
- The lack of appropriate setbacks/buffers from adjacent land uses on watershed streams

- The lack of appropriate setbacks/buffers from adjacent land uses along stormwater conveyance features
- Inadequate/poor riparian condition and structure throughout the watershed

Description of each land use and its associated water quality impacts without the appropriate BMPs in place are detailed below.

Dryland Crop Production

Results of the riparian assessment identified approximately 345 acres of Spring Flat Creek Watershed riparian area currently in dryland crop production. Located in the Palouse region, the Spring Flat Creek Watershed contains highly productive soils for dryland crop production, and this is the dominant land use in Spring Flat Creek. Dryland crop production can impact water quality in several ways, and those impacts often vary in severity depending on producer specific tillage and fertilizer practices, crop types and rotations, proximity to waterways, and topography, among other factors. It is a common practice in the Palouse region, including Spring Flat Creek, to perform tillage and seeding activities up to eroding perennial and seasonal streams (Figure 4). Tillage and seeding often occurs through ephemeral and seasonal stream channels (Figure 5).

Figure 4. Dryland agricultural production up to eroding streambank.

Figure 5. Dryland agricultural production through ephemeral stream

Water quality impacts from dryland crop production in riparian areas include:

- Temperature
    - Inadequate riparian vegetation structure and function - most trees, shrubs, and herbaceous vegetation that historically comprised the riparian area in Spring Flat Creek have been cleared for agricultural production. The annual crops of dryland production, such as wheat and lentils, do not provide the adequate riparian structure necessary to shade the stream and protect surface water from solar radiation.
    - Lowered stream flows during the summer critical period - a secondary way that dryland agriculture practices can contribute to temperature problems in the watershed is low stream flows during the critical period resulting from reduced rainfall infiltration. Scientific studies around tillage practices, such as decreased infiltration and increased surface run-off, indicate that current stream flows

during the critical summer period are likely reduced compared to the pre-settlement condition.

- Aggradation – tillage practices associated dryland crop production within the riparian areas cause ground disturbance that often results in soil erosion and sedimentation. Sedimentation of a stream can cause it to widen and become shallower (aggradation), which increases the solar input, reduces the area of effective shade, and the shallower water will heat faster and more uniformly than deeper water (Figure 6). Eroding streambanks described below also contribute to aggradation.

Figure 6. This stream has become aggraded in the center and is now growing cat tails and reed canary grasses and has avulsed into two separate channels.

- Dissolved Oxygen and pH
  - Temperature – DO and pH are directly influenced by temperature. The lack of riparian structure from dryland crop production in the riparian area reduces the shade needed to achieve natural DO and pH levels and meet state water quality standards.

- Nutrients from fertilizers and upland soil erosion – the application of fertilizers on dryland crop production is common in the Palouse Watershed. Nutrients from fertilizers are rapidly taken up by the crops, but any remaining is incorporated into the soil. Therefore, erosion from dryland crop production lands can carry nutrients attached to sediment into streams (Figure 7), increasing algae production and negatively affecting DO and pH. Fertilizer may also leach through the soils to groundwater and then flow subsurface to streams.
- Nutrients from eroding streambanks – some Spring Flat Creek waterways are actively eroding. Often this is a long-term effect of riparian vegetation removal, channel straightening, and land use practices up to the edge of streams, (Figure 8). Sediment from eroding stream banks can carry and deposit nutrients in the stream, exacerbating the impacts of algae productivity on DO and pH.

Figure 7. Rill erosion on dryland agricultural production site, a stream runs east to west in photo where rills merge.

Figure 8. Eroding streambanks from dryland agricultural production up to streambank.

Livestock Feeding, Pasture, and Rangeland

Approximately 88 acres of Spring Flat Creek Watershed riparian areas are currently impacted by livestock. Livestock impacts to water quality result from the animals grazing the riparian corridor, winter feeding in or adjacent to the riparian areas, and direct access to surface waters. Riparian areas subject to livestock impacts generally show signs of bare soils, compaction, erosion, cattle trailing, low tree and shrub composition and diversity, wide and shallow stream morphology, and lack of young age-class woody species. Water quality impacts from dryland crop production in riparian areas include:

- Temperature
  - Degraded riparian vegetation structure and function - most of the riparian vegetation that historically comprised the riparian area has long ago been cleared for agricultural production. Most riparian areas used for livestock grazing and feeding are now comprised of herbaceous non-native grass species. Livestock grazing and trampling within these riparian areas inhibits the regeneration of native woody vegetation necessary to shade the stream and protect surface water from solar radiation (Figure 10).

Figure 9. Grazed riparian area.

- Aggradation – livestock hoof action within riparian areas can cause ground disturbance and loosen soils that lead to soil erosion or sedimentation. As with tillage in the riparian area, erosion and sedimentation from livestock activity can cause a stream to widen and become shallower (aggradation), which increases the solar input, reduces the area of effective shade, and the shallower water will heat faster and more uniformly than deeper water.

- Dissolved Oxygen and pH
    - Temperature – DO and pH are directly influenced by temperature. The grazing and trampling of riparian vegetation can reduce shading needed to achieve natural DO and pH levels.
    - Nutrients from livestock waste – manure and urine from livestock are a source of nutrients that can be deposited directly into the stream. Furthermore, manure and urine deposited in the riparian area is subject to runoff into the stream from precipitation events and through groundwater leaching. Nutrients from livestock waste increase algae production, negatively affecting DO and pH (Figure 10).

Figure 10. Horse access to stream surface water and riparian area.

- Fecal coliform bacteria – there are fecal coliform bacteria impacts associated with livestock land use within streams and riparian areas. Spring Flat Creek has a listing for fecal coliform bacteria that is categorized as 4a, because it is being addressed as part of the Palouse River Fecal Coliform Bacteria TMDL. The livestock BMPs recommended in this STI for addressing DO and pH impairments are also designed to address fecal coliform bacteria impairments.

Perennial Grasses

Approximately 47 acres of Spring Flat Creek Watershed riparian areas (35 feet from OHW) are categorized as having predominately perennial grasses, with no trees or shrubs. These areas passively affect water quality by lacking the riparian vegetative structure needed to provide adequate riparian function for water quality protection. These areas were likely cleared of riparian vegetation for historical agricultural purposes. Often these areas cannot be effectively farmed due to their hydric soils. Consequently, most of these areas within this land use type are dominated by reed canary grass (*Phalaris arundinacea*) (Figure 11), a Class C invasive noxious weed.

Figure 11. Reed canary grass dominated riparian area.

These areas negatively affect water quality through:

- Temperature
    - Inadequate riparian vegetation structure and function – Riparian areas cleared of native vegetation and used for another purpose will in most cases be recolonized by invasive non-native vegetation soon after the management of that land ceases. Once established, reed canary grass forms a monoculture that lacks the riparian structure necessary to shade the stream and protect surface water from solar radiation (Figure 12). Monocultures of reed canary grass also inhibit regeneration of native woody vegetation critical for providing shade to the stream and regulating water temperature.
- Dissolved Oxygen and pH

- Temperature – As noted above, DO and pH impairments are directly influenced by temperature. The lack of riparian structure from inadequate riparian structure reduces the shade needed to achieve natural DO and pH levels.

Figure 12. Reed canary dominated riparian area inhibits natural woody recruitment.

Impervious Surfaces/Roadways

Approximately 34 acres of Spring Flat Creek Watershed riparian areas are roadways or impervious surfaces. Like many streams in eastern Washington, most of them have been historically re-aligned into roadside ditches to ease seeding and harvest and maximize crop production acres. Mainstem Spring Flat Creek runs parallel to State Route 195 for most of its length, in some sections doubling as the roadside ditch (Figure 13). There are also several Spring Flat Creek tributaries that are in county roadside ditches (Figure 14). Impervious surfaces in riparian areas reduce infiltration and do not provide any riparian vegetative function.

Figure 13. Spring Flat Creek along Hwy 195

Figure 14. Spring Flat Creek tributary along Whitman County roadway

Consequently, water quality impacts from impervious surfaces and roadways in riparian areas include:

- Temperature
  - Inadequate riparian vegetation structure and function – impervious surfaces and roadways located within the critical riparian zone of a stream do not provide the vegetative structure necessary to shade the stream and mitigate thermal radiation.
- DO
  - Temperature – DO and pH impairments are directly influenced by temperature. The lack of riparian structure from impervious surfaces and roadways located in riparian areas reduces the shade needed to achieve natural DO and pH levels.

Non-Stream Stormwater Conveyance Features

There are approximately 40.6 miles of roadway in Spring Flat Creek. Assuming roadways have a stormwater conveyance feature (ditch) on both sides of the road, there are approximately 81.2 miles of roadside ditch in Spring Flat Creek. It is estimated 7.4 miles of Spring Flat Creek streams have been historically re-aligned into roadside ditches and were accounted for during the riparian land use assessment. Therefore, there are approximately 73.8 miles of non-stream stormwater conveyance features in Spring Flat Creek that were not captured in the riparian land use assessment. Water quality impacts from non-stream stormwater conveyance features include:

- Temperature, DO, and pH – stormwater conveyance features (ditches) convey stormwater down-gradient during precipitation and snow melt events. Ditches eventually connect with Spring Flat Creek and consequently can impact water quality (Figure 15). The jurisdictional line between roadside stormwater discharge features and adjacent land uses is often difficult to locate. County and state road rights-of-way are often farmed. As a result, most roadside ditches are farmed up to the edge, resulting in impacts to water quality.

Figure 15. County stormwater conveyance feature discharging down gradient into Spring Flat Creek mainstem - Spring Flat Creek mainstem runs east to west under bridge on SW portion of image.

Figure 16. Runoff from dryland agricultural field into county stormwater culvert

Description of the Nonpoint Source Best Management Practices (BMPs)

This section identifies the BMPs needed to protect surface water quality in Spring Flat Creek. Ecology believes when landowners or operators apply the practices identified below, the water quality standards for temperature, DO, and pH will be met.

The agricultural BMPs discussed below should be designed, implemented, and constructed to the standards of the Natural Resource Conservation Service (NRCS) Field Office Technical Guide (FOTG). However, it is important to note the FOTG practices are not standalone performance standards. Instead, they are a set of general practices used by NRCS as a part of their voluntary agricultural technical assistance. Undergoing NRCS farm planning does not ensure a landowner is complying with water quality law.

In most cases, to ensure compliance with water quality laws, a suite of practices must be implemented. To provide clear recommendations that we believe will adequately protect water quality we are developing The Voluntary Clean Water Guidance for Agriculture[2], a series of chapters that address different types of conservation practices to best prevent water pollution and protect water quality. This guidance is being developed in phases. There are five chapters that are currently completed and submitted to EPA: 1) Cropping Methods- Tillage and Residue Management; 2) Riparian Areas and Surface Water Protection; 3) Livestock Management-Pasture and Rangeland Grazing; 4) Sediment Control- Soil Stabilization and Sediment Capture (Structural); and 5) Livestock Management: Animal Confinement, Manure Handling and Storage. The remaining eight chapters will be completed by the end of 2025. If an operation uses suites of practices consistent with the recommendations in this guidance to address all farm-specific pollutants and water quality concerns, Ecology will presume that water quality is being adequately protected by the operation. Providing this certainty and predictability to producers and farm planners is one of the main goals of this guidance.

The BMPs identified below are consistent with that guidance and represent the minimum steps needed to meet water quality standards. Depending on site specific conditions, additional BMPs may be necessary and recommended by Ecology field staff, the local conservation district, or a local NRCS planner. These BMPs are not unique, unusual, or burdensome and many landowners in the area have already implemented these practices. There are also state and federal grant funding available to cover the expense of most of the implementation needed.

[2] https://apps.ecology.wa.gov/publications/SummaryPages/2010008.html

Dryland Crop Production BMPs

This section describes tillage and residue management practices that support healthy farms and help producers meet clean water standards. All the information found in this section is derived from "*Chapter 1 – Cropping Methods: Tillage & Residue Management"*, of the *Voluntary Clean Water Guidance for Agriculture* (Ecology, 2022). For additional information on these BMPs or on their effectiveness, please see that document.

Primary BMPs

Vegetated Riparian Buffer: An area of the stream corridor set back from agricultural production and restored for the riparian function of water quality protection. The area includes permanent perennial vegetation and is located adjacent to and upgradient from the stream. The type of vegetation planted in buffers should include native trees and shrubs, suitable for the site, to fully protect water quality. To successfully install buffers, other BMPs such as bank stabilization and invasive weed control may also be necessary. The width of the buffer is measured horizontally on a line perpendicular to the water body beginning at the ordinary high-water mark. For information on specific riparian buffer widths and types see the "Dryland Crop Production RMZ Core Zone and Outer Zone Width Range Recommendations" and section Chapter 12 of the Voluntary Clean Water Guidance for Agriculture.

Conservation Tillage and Residue Management: The underlying analysis used to determine these guidance metrics is provided in Chapter 1 Appendix Part A of The Voluntary Clean Water Guidance for Agriculture[3], December 2022. From a water quality perspective, the primary aim of conservation-based tillage and residue management is to reduce erosion by minimizing soil disturbance and maximizing the retention of crop residue on the soil surface. Erosion is influenced by multiple factors, including rainfall intensity and duration, soil texture, field topography, tillage methods, and soil vegetative cover. Many of these factors cannot be controlled, however, producers can significantly decrease erosion from their fields through conservation tillage methods and residue management.

Ecology's guidance for using tillage and residue management to address water quality concerns is based on two general crop groupings: high and low levels of post-harvest residue production.

- For higher residue crops, a minimum residue coverage target (or alternatively a maximum Soil Tillage Intensity Rating (STIR)) is recommended to protect water quality.
- For low residue crops, producers should try to minimize tillage while maximizing the production of residue within the overall rotation.

Additionally, supplementing residue with cover crops or using alternative practices that can trap sediment may be necessary to protect water quality. It is recognized that not all crops

[3] https://apps.ecology.wa.gov/publications/SummaryPages/2010008.html

generate the level of residue recommended to provide water quality protection. For both groups, it is impossible to completely prevent all erosion and surface water runoff solely using tillage and residue management practices. Ecology anticipates that tillage and residue management practices will be implemented along with other practices appropriate to the operation to fully address operation-specific water quality concerns.

High Residue and Perennial Crops

To protect water quality for high residue and perennial crops, a conservation-based tillage system should achieve:

- **A residue coverage of 60% or more**. The residue coverage expectation is based on the minimum residue coverage observed from harvest through the next planting; or
- **A STIR of 30 or less** based on NRCS guidance and calculation tools. (In some areas of the state, higher residue crops, because of site specific factors (e.g., soils, annual rainfall, etc.), cannot achieve the recommended residue levels. In those cases, producers should utilize conservation tillage systems that meet the STIR recommendation).

Residue coverage of 60% can provide an effective erosion protection of approximately 90% as compared to conventional tillage. In general, while a wider variety of tillage options are available to producers who grow higher residue crops, this residue level is best achieved through no-till or direct seed tillage systems. Both systems minimize tillage and provide a higher retention of surface residues, while protecting surface soils, thereby fostering the building of soil organic matter. Depending on site specific factors this recommendation can also be achieved with other conservation-based tillage systems (e.g., mulch till).

Lower Residue Crops

Because conservation tillage may not be possible or the best option for some low residue crops, producers of these crops might choose to use different practices (e.g., filter strips, cover cropping) to address water quality concerns. For producers of low residue crops who choose to use conservation tillage practices to protect water quality, a conservation-based tillage system should:

- **Achieve a STIR of 30 or less** based on NRCS guidance and calculation tools if a 30 STIR is achievable for the type of crop grown (there are many vegetable row crops, e.g., root crops, where achieving a STIR level below 30 is not possible given the planting and harvest methods required for those crops); or
- **Minimize tillage to the maximum extent possible** and supplement residue cover to achieve 60% soil coverage. Producers can increase soil cover at critical times by planting in-row cover, planting post-harvest cover crops, double cropping, and/or through crop rotation planning; and

- **Use supporting sediment trapping BMPs** to protect water quality from erosion in cases where it cannot be controlled in the field.

Residue Management

- Residue should be spread evenly, and stubble and root structures retained (as appropriate to the crop type).
- Management of residue should not include burning.
- If post-harvest residue is harvested for other purposes, removal should not exceed levels required to maintain 60% residue cover after planting.
- Crop rotation planning should factor in the levels of post-harvest residue produced and maintained.

Avoid fall tillage except to plant a double or fall crop or when establishing a cover crop.

Secondary BMPs

Effective water quality protection and compliance with water quality standards requires a combination or system of practices to fully address all concerns. Common practices that complement tillage and residue management include those that trap sediment that leaves the field, filter pollutants, and protect sensitive areas. These practices may include but are not limited to:

Sediment Control– Vegetative (alternate field cover practice option)

- Cover cropping

Sediment Control – Vegetative (additional practices to trap or contain sediment from erosion)

- Field borders
- Filter strips
- Grassed waterways
- Vegetative barriers
- Vegetated treatment areas
- Field windbreaks

Crop Systems (additional practices to reduce transport within the field)

- Contour farming
- Alley cropping
- Conservation crop rotation
- Strip cropping
- Contour buffer strips

Sediment Control – Structural (additional practices to trap or contain erosion)

- Sediment basins
- Water and sediment control basins

Alternative Practices

The recommended practices identified above provide practice-based certainty and predictability because the practices have been specifically evaluated for their protection of water quality.

Producers may choose to demonstrate to Ecology that alternative management practices are as effective in preventing water pollution for their operation. If a producer decides to go this route, Ecology recommends they consult with the regional NRCS office or local conservation district for technical assistance. Ecology remains responsible for determining if water quality is protected.

Livestock Pasture, Feeding, and Rangeland BMPs

BMP Recommendations for Streamside Areas and Adjacent Uplands

The following practices are recommended to protect streamside areas, prevent the generation and discharge of pollutants to surface waters, and support healthy upland pastures and rangeland:

- Protect and Restore Riparian Management Zones (RMZ)
- Permanent streamside exclusion fence
- Off-stream water facilities
- Heavy use area stabilization
- Stream crossing (where applicable)
- Emergency water access point (where applicable)
- Grazing management
- Seasonal animal confinement

These BMPs are discussed in more detail below. All the information found in this section is derived from "Chapter 10 - Livestock Management: Pasture & Rangeland Grazing", and "Chapter 11 – Livestock Management-Animal Confinement, Manure Handling & Storage" of the Voluntary Clean Water Guidance for Agriculture (Ecology, 2022). For additional information on these BMPs or their effectiveness, please see that document.

Primary BMPs

<u>Vegetated Riparian Buffer</u>: An area of the stream corridor set back from livestock pasture, feeding, and rangeland areas, and restored for riparian function and water quality protection. The area includes permanent perennial vegetation and is located adjacent to and upgradient from the stream. The type of vegetation planted in buffers should be native trees and shrubs, suitable for the site, to fully protect water quality. To successfully install buffers, other BMPs such as bank stabilization and invasive weed control may be necessary. The width of the buffer is measured horizontally on a line perpendicular to the water body beginning at the top of bank. (FOTG Practice Code 391). See "Livestock Feeding, Pasture, and Grazing RMZ Core Zone and Outer Zone Width Range Recommendations" for buffer type and width information.

Secondary BMPs

<u>Livestock Exclusion Fence</u>: Restricting livestock access to waterways and associated riparian areas and providing alternative water sources benefits riparian habitat, streams, and water quality. Restricted livestock access can also improve livestock productivity, animal health, and increase opportunities to improve forage management. Permanent exclusion fencing also supports the implementation of Riparian Management Zones by preventing livestock from entering streams and certain areas within RMZs (at a minimum the core zone of the RMZ), as described in the Riparian Management Zone recommendations (see "Livestock Feeding,

Pasture, and Grazing RMZ Core Zone and Outer Zone Width Range Recommendations" for more information).

Irrigation canals, roadside and field ditches convey significant volumes of water and commonly outlet to streams and can be conduits between grazing areas and streams. Therefore, it's important to ensure that livestock impacts do not occur in or adjacent to these conveyances. To protect water quality, livestock must be excluded at least 25 feet from these types of conveyances, and vegetative practices such as filter strips must be used to prevent polluted runoff from entering surface waters. Setbacks and vegetative practices widths may be adjusted based on site-specific factors.

There is a wide variety of fence types, but the material and construction method chosen must ensure that livestock do not enter restricted areas at any time. Standard post-and-wire fences are suitable as permanent fencing in areas that receive moderate to heavy grazing. For post-and-wire fences, barbed or smooth wire are suitable and electric fence may be included as necessary. Other types of fencing such as woven wire may also be suitable if designed to restrict the size and type of grazing animals. Permanent fencing must be constructed to Natural Resource Conservation Service construction specifications or equivalent standards.

Recommendations and Considerations:

- The preferred option is to install permanent fencing to exclude livestock from the entire RMZ.
- At a minimum, permanent fencing must be installed on the upland edge of the core zone and may need to be installed to prevent access to filter strip areas where needed.
- Fencing must, at a minimum, prevent livestock from accessing the core zone.
- Standard post-and-wire fences are suitable as permanent fencing and may include barbed, smooth, or electrified smooth wire.
- Other types of fencing may also be suitable if designed to restrict the size and type of grazing animals.
- Fencing must be constructed to Natural Resource Conservation Service specifications or equivalent standards.

Supporting NRCS Field Office Technical Guides: Fence (382)

Off-stream Water: A consistent supply of high-quality water is vital to maintaining healthy and productive livestock. Off-stream watering systems create many opportunities to improve forage management and nutrient distribution, increase livestock productivity and protect riparian zones and water quality. Along with fencing, off-stream water is also a key practice commonly used when implementing grazing management systems.

There are a wide range of options to capture, store and deliver water to livestock, and farm level systems often utilize a combination of water sources and systems. Tanks, troughs, and ponds are common methods of providing water for livestock, and large watering tanks, separate storage tanks or ponds are often used to store water for future use. Water is typically delivered through mechanical and electric pumps or gravity feed systems.

The choice of systems selected will depend on a variety of factors such as water source, availability of electrical power, pasture layout, required volume of water, season of use, cost, potential for seasonal freezing, reliability, need to store water and producer preferences. It is also important to ensure off-stream water systems are consistent with state Water Resources law and stock water policies.

While each of these factors will need careful consideration, off-stream water facilities must be designed to provide enough water to meet the daily and seasonal needs of grazing livestock and accommodate the maximum number of animals anticipated to drink at any one time. The volume of water needed will vary based on the type of animal, age, size, reproductive cycle, environmental conditions and whether livestock water in groups or individually. It is highly recommended to consult with a livestock grazing specialist, knowledgeable contractor, or engineer to determine the amount of water needed and to ensure the system design will meet those needs.

Pumps and gravity systems are the two main types of watering systems. Examples of common watering systems include:

- Electric pumps –solar powered or dedicated power source
- Gravity-fed
- Solar pump
- Wind pump
- Hydraulic ram pump
- Nose pump
- Sling pump
- Fuel pumps and generators
- Mobile tanks/hauling water

Water Placement: Careful placement of water developments can support improved animal distribution and help alleviate uneven forage utilization. However, water developments may also concentrate disturbances and manure and urine deposition, and lead to the formation of trails. Therefore, it's important to place off-stream water away from riparian areas and any flow paths to surface waters. Off-stream water placement will vary depending on site specific factors but should be placed outside Riparian Management Zones as outlined in the "Livestock Feeding, Pasture, and Grazing RMZ Core Zone and Outer Zone Width Range Recommendations" section whenever possible. To avoid heavy traffic and forage use near Riparian Management Zones, greater setbacks from Riparian Management Zones are highly recommended.

In situations where it's not feasible to pump water outside the Riparian Management Zone, off-stream water developments may be placed within Riparian Management Zones under the following conditions:

- Off-stream watering facilities must be placed outside the core zone.
- The area adjacent to the watering facility must be stabilized with heavy use are protection that meets NRCS or equivalent design and construction specifications.
- The location of the off-stream watering facility and nearby areas must not be saturated for extended periods during the grazing season.
- The area must not receive significant run-on or have direct or preferential flow paths to surface waters.
- Additional BMPs such as filter strips may be needed down gradient of the water development. Filters strips should be implemented consistent with the Riparian Areas and Surface Water Protection guidance outlined in "Livestock Feeding, Pasture, and Grazing RMZ Core Zone and Outer Zone Width Range Recommendations" section.

Wet Pastures and Sacrifice Areas

Wet and saturated pastures are a common occurrence from late fall through spring in Washington. As soils become wetter, they are less able to withstand livestock traffic. Traffic on wet pastures generates mud, causes soil compaction and erosion, and damages the roots and crowns of plants. To limit soil and forage damage within pastures, it is important to take the proper actions to protect pastures during wet periods. Not taking precautions to protect wet pastures can cause excessive damage, reduce forage production and lead to polluted runoff.

A common solution used to prevent negative impacts to pastures and water quality is to establish seasonal sacrifice areas. Sacrifice areas are locations where animals are fenced or penned into a dedicated area for a period of time when grazing can be detrimental to plants, soils, and water quality. Sacrifice areas are most commonly used from mid-fall to mid-spring when fields are wet or saturated or when there is no available forage. However, sacrifice areas can also be used late in the grazing season or during periods of drought to avoid damage to recovering plants. These areas may be used to separate animals or care for sick or injured animals as well. The main goals of sacrifice areas are to ensure most grazing lands are rested, to stay productive and to prevent negative impacts to water quality. It may be important to understand ground water nitrate levels and the hydrology of the area to ensure a sacrifice area makes sense for a given location.

Sacrifice areas can be improved or unimproved areas depending on the location, site characteristics, and preferences of the operator. Improved sacrifice areas include a footing material such as sand, gravel, wood chips or other wood products such as hog fuel, and a geotextile underlayment. Each material has advantages and disadvantages, such as cost, life span, suitability, and ease of use, that should be considered prior to selection. The decision to use an improved or unimproved sacrifice area will be site specific and depend on the goals and needs of the livestock operator. Nevertheless, sacrifice areas must not be a source of water pollution.

Site selection is a key consideration when establishing a sacrifice area, especially when the area will be unimproved. Locate sacrifice areas as far as possible from surface waters or conduits to surface waters, such as swales, ditches, or ephemeral streams. At a minimum, sacrifice areas should be placed outside Riparian Management Zones as outlined in the "Livestock Feeding, Pasture, and Grazing RMZ Core Zone and Outer Zone Width Range Recommendations" section; however, site specific factors may require greater setbacks. When selecting a location, choose elevated areas with good drainage and avoid frequently flooded areas, locations that are seasonally saturated, or areas that receive significant upland runoff, or runoff from adjacent buildings. Additional factors to consider when selecting a location include slope, potential for preferential flow paths, sacrifice area size, numbers of animals, and the frequency and duration of use. Elevated pads constructed above grade may be used at low-lying sites or flood-prone locations when necessary.

When site specific factors are likely to cause pollution to reach surface waters, alternative sites should be considered. If alternative sites are not available or if sacrifice areas cannot be located outside of Riparian Management Zones, improved sacrifice areas should be used and additional BMPs may be needed. Improved sacrifice areas should meet NRCS or equivalent design and construction specifications for Heavy Use Area Protection (Field Office Technical Guide 561) and prevent polluted runoff from entering surface waters.

Footing is a critical component of developing a well-drained, durable sacrifice area. Footing materials are used to build up the soil surface to limit compaction and facilitate infiltration, decrease mud and runoff, and provide a healthy and comfortable environment for confined livestock. Along with proper siting and footing, livestock should be confined to sacrifice areas using sturdy and safe fences that can reliably contain animals.

It's important to minimize the amount of runoff that enters sacrifice areas. Preventing runoff from entering sacrifice areas will prolong the life of the footing materials, provide a more comfortable environment for livestock, reduce maintenance, facilitate manure collection, and help prevent polluted runoff from leaving the site. Install gutters on animal shelters, barns, and sheds, and divert roof runoff away from sacrifice areas. Berms, swales, and subsurface drains may be used to divert upgradient runoff from sacrifice areas.

Sacrifice areas will need periodic maintenance and manure removal. It's important to periodically inspect sacrifice areas, especially after significant precipitation events, to ensure the area hasn't become saturated or inundated, that runoff isn't reaching surface waters, and that footing material hasn't been eroded. Regular removal and management of manure should also be conducted. Manure accumulations should be stored in a waste storage structure with consideration of water quality impacts in siting and design, until it can be land applied, or properly used or disposed of.

Heavy Use Area Protection – Areas where livestock congregate frequently or for long periods of time, such as watering facilities and sacrifice areas, often become unstable and are subject to compaction, erosion, and muddy conditions, especially after precipitation or during wet seasons. Heavy use area protection provides a stable, non-eroding surface and is commonly used at off-stream watering facilities and sacrifice areas, especially when these sites are likely to become muddy or erode. Heavy use area protection may also be used in other locations, such as areas where mineral supplements are provided, supplemental feeding areas and loading corrals. Concrete or compacted gravel are typically used to stabilize areas around off-stream water developments and feeding areas. A variety of footing materials may be used for sacrifice areas including sand, gravel, wood chips or other wood products such as hog fuel.

Recommendations and Considerations:

- Size heavy use areas protection to prevent unstable conditions near water facilities.
- Design the foundation and base according to the animal type, traffic frequency and site soil conditions.
- Heavy use area protection areas must be designed and constructed according to NRCS specification or equivalent standards.
- Consult with local NRCS, University Extension or conservation district staff when planning to install heavy use area protection.

Supporting NRCS Field Office Technical Guides: Heavy Use Area Protection (561), Trails and Walkways (575)

Stream Crossing – Stream crossings are sometimes needed to provide livestock or equipment access to pastures on the other side of a stream without damaging streambanks or the streambed. This practice applies to ephemeral, intermittent and perennial water courses and includes fords, bridges, or culvert-type crossings.

Culverts and bridges are best suited to prevent disturbances to streambanks and streambeds and should be used in high traffic areas and where fish or large woody debris are expected. Culverts can impede passage of fish and other aquatic organisms and must be appropriately sized and installed to prevent obstructions.

Ford crossings are created by stabilizing the streambed with concrete or rock and geosynthetic material (natural materials are preferable). Ford crossings may be suitable for shallow, low-velocity watercourses with gentle sloped streambanks and a firm streambed. Ford crossings are not suitable for high traffic areas with frequent use. Bridges or culverts should be used for high traffic situations.

Recommendations and Considerations:

- Livestock-only crossings should be less than 6 feet in width and all crossings must be no greater than 30 feet wide as measured from the upstream to downstream end.
- Bridges and culverts must be used for high-traffic crossings, such those used daily or weekly.
- Ford style crossings are only suitable for low-velocity streams with firm streambeds and infrequent use.
- Stream crossing approaches must be limited in width and no wider than 30 feet.
- All crossings must include permanent fence to prevent livestock access to riparian areas (see permanent fence requirements).
- Livestock must be excluded from the stream crossing approaches using fence and gates. Exclusion fencing and/or gates must be located on the outer, upland edge of the riparian buffer and filter strip (when a filter strip is required).
- Use of ford crossings for livestock watering is prohibited except for emergencies (see Emergency Water Access Points below).
- Any form of work that uses, diverts, obstructs, or changes the natural flow or bed of any fresh water or saltwater of the state, requires a Hydraulic Project Approval (HPA)2 from the Washington Department of Fish and Wildlife (WDFW). Therefore, all proposed stream crossings must be reviewed by the Washington State Department of Fish and Wildlife prior to installation.
- At a minimum, all stream crossings must be designed and installed according to NRCS specifications in accordance with Field Office Technical Guide 578 (Stream Crossing) and any additional requirements that may be required as part of obtaining a HPA from WDFW. Designs that provide the greatest ecological functions are preferred.

Supporting NRCS Field Office Technical Guides: Stream Crossing (578), Trails and Walkways (575) and Fence (382).

Emergency Stream Access Points - An emergency access point is a location along a stream where livestock can temporarily access the stream for drinking water purposes. These locations may be needed or desired as a contingency should off-stream water equipment fail or need to be maintained or replaced. However, they must only be used under emergency situations and may not be used as alternatives to permanent off-stream water sources.

Ford style stream crossings may serve as emergency water access points. Where ford style crossings aren't installed or available, temporary access points may be created using gates and fencing to create a narrow lane from upland areas to the stream. Lanes should not be cleared and must maintain native riparian vegetation.

Recommendations and Considerations:

- Emergency access points must be no greater than 10 feet wide as measured from the upstream to downstream end.
- Use of emergency access points must be limited to the time needed to repair off-stream watering facilities or move livestock to an alternative location where viable off-stream water is available.
- Access points cannot be used in lieu of installing or maintaining permanent, reliable off-stream watering facilities.
- Riparian vegetation must be maintained in lanes created for emergency water access and clearing is prohibited.
- Lanes should be the shortest distance possible from upland grazing areas to the stream.
- Emergency access locations must be limited in number and geographic extent.

Supporting NRCS Field Office Technical Guides: Stream Crossing (578), Trails and Walkways (575) and Fence (382).

<u>Grazing Management Plans</u> - Grazing management has been shown to decrease pollutants such as sediment, nutrients, and bacteria from being transported from upland areas to surface waters via runoff; however, much of the pollutants entering surface waters originates from areas near streams as of result of livestock congregating in riparian zones. The availability of water, forage quantity and quality, temperature, topography, and availability of shade are the primary factors that determine grazing distribution. Given that riparian areas provide most grazing animals' requirements and are easily accessible, riparian areas are commonly overused by livestock. Congregation within riparian areas, overutilization of riparian vegetation and accessing streams to drink are the primary sources of pollution entering surface waters from grazing lands. Further, congregation in the riparian areas often leads to uneven livestock distribution, causing upland forage to be underutilized or left completely ungrazed.

Grazing management strategies attempt to balance forage removal and plant health by adjusting the timing of grazing, stocking rates, duration of grazing and periods of rest to maximize forage utilization while promoting recovery (Swanson et. al, 2015). In doing so, a primary goal is to improve animal distribution on the landscape, and thereby promote even use of palatable, nutritious plant communities while attempting to limit the overuse of forage in sensitive upland and riparian plant communities. The overarching goal of grazing management systems is to help livestock managers better control animal behavior and tendencies to maximize forage potential and utilization while simultaneously promoting pasture and rangeland health.

Management methods used will vary from location to location based on site and regional characteristics and producer's goals, and every grazing strategy will invariably include advantages and disadvantages that must be considered.

For more information on grazing management strategies and planning considerations see "Chapter 10 - Livestock Management: Pasture & Rangeland Grazing", of the Voluntary Clean Water Guidance for Agriculture (Ecology, 2022)

Perennial (Invasive/Non-native) Grasses BMPs

These areas affect water quality because perennial grasses lack the riparian vegetative structure needed for water quality protection. These areas were likely cleared of riparian vegetation for historical agricultural purposes. Consequently, much of the riparian area within this land use type is dominated by reed canary grasses.

Primary BMP

Riparian Restoration

The type of vegetation planted in buffers should be native trees and shrubs, suitable for the site, to fully protect water quality. Riparian restoration may necessitate other BMPs such as bank stabilization and invasive weed control. Refer to Chapter 12: Riparian Areas & Surface Water Protection for recommendations or contact the local NRCS or conservation district office.

Impervious Surfaces/Roadways BMPs

Primary BMP

The Stormwater Management Manual for Eastern Washington (SWMMEW)[4], provides guidance for the measures necessary to control the quantity and quality of stormwater in eastern Washington. Local jurisdictions should use this manual to set stormwater requirements for new development and redevelopment projects. Land developers and designers should use

[4] https://fortress.wa.gov/ecy/ezshare/wq/Permits/Flare/2019SWMMEW/Content/Resources/DocsForDownload/2019SWMMEW_8-13-19.pdf

this manual to design permanent stormwater control plans, develop construction stormwater pollution prevention plans, and determine stormwater infrastructure BMPs for water quality protection. Businesses should use this manual to help design their stormwater pollution prevention plans.

Non-Stream Stormwater Conveyance Features BMPs

Primary BMPs

Vegetated Buffer **–** A buffer or land use setback from stormwater conveyance features. Land use impacts adjacent to non-stream stormwater conveyance features such as roadside ditches can contribute pollutants to stormwater and consequently down gradient where the conveyance feature is discharged into Spring Flat Creek. Permanent perennial vegetation should be installed adjacent to and up-gradient from stormwater conveyance features. The type of vegetation planted in non-stream stormwater conveyance feature buffers should be permanent perennial herbaceous vegetation suitable for the site. The buffer recommendation for this practice is 15 feet from the stormwater conveyance feature's top of bank for all land uses except for livestock grazing – see "Livestock Feeding, Pasture, and Grazing RMZ Core Zone and Outer Zone Width Range Recommendations" section for more information. Whitman County and Washington State Department of Transportation (WSDOT) will need to work with landowners on right of way responsibilities and implementation efforts, as much of the right of way areas in Spring Flat Creek are in agricultural production.

Stormwater BMP Infrastructure

In combination with perennial herbaceous vegetated buffers, the appropriate best management practices identified in the Stormwater Management Manual for Eastern Washington (SWMMEW)[5], should be followed by local jurisdictions.

Riparian Management Zone (RMZ) - Buffer Recommendations

All the information found in this section is derived from "Chapter 12 Riparian Areas & Surface Water Protection", of the Voluntary Clean Water Guidance for Agriculture. For additional information on Riparian Management Zones, buffer widths, buffer types, or on buffer effectiveness for water quality protection, please see that document.

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[5] https://fortress.wa.gov/ecy/ezshare/wq/Permits/Flare/2019SWMMEW/Content/Resources/DocsForDownload/2019SWMMEW_8-13-19.pdf

Riparian Management Zone (RMZ) Definitions

The terms RMZ and Buffer are not identical in definition and should be more clearly defined for the purposes of this guidance. The main difference you'll see below is the RMZ can consist of several types of buffers, or a single buffer type. Following those definitions are some other definitions for words used in this section.

RMZ (Riparian Management Zone): The land adjacent to surface waters for which management actions are tailored to maintain specific resource objectives, in particular, water quality protection and the provision of aquatic and riparian habitat for fish and wildlife. A RMZ may be wider or narrower than the entire riparian area. For example, in arid regions or in steeper terrain, the RMZ is often wider than the riparian area, but in wetter regions, the RMZ may be narrower than the riparian area. **The RMZ may consist of one or more buffer types and may include one or more agricultural best management practices.**

Practice Definition - A Riparian Management Zone (RMZ) functions to:

- Regulate the flow of surface runoff generated from the uplands into the riparian area
- Capture, retain and/or transform pollutants in the flow of surface and subsurface water
- Inhibit stream bank erosion
- Provide stream shading (i.e., to prevent temperature pollution)
- Provide a supply of organic materials (e.g., wood and leaf litter) to streams and riparian areas
- Provide habitat for fish, mammals, birds, amphibians, reptiles, insects, macroinvertebrates, etc.
- Provide riparian microclimate and hyporheic zone protection

The recommended RMZ for a site is dependent on several factors including (more on this further down):

- Stream channel width and type (ephemeral, intermittent, and perennial)
- Soil hydrologic group
- Adjacent land use intensity
- Site potential (SP) native plant community

Buffer: The land between streams and adjacent land uses that prevents pollutants from entering the waterway. The buffer width and type needed to provide that function is dependent on many different factors, and there are many different types of buffers. **One or more types of buffers may be used in an RMZ**. For example, an RMZ may consist of a 50-foot riparian forest buffer directly adjacent to a stream and a 20-foot grass filter strip buffer on the outer edge of the riparian forest buffer, between the riparian forest buffer and adjacent land use.

Channel Width: The average width of the stream at the bankfull channel elevation in straight sections of a stream reach.

Core Zone: This is the zone closest to the stream and is planted with native tree and shrub vegetation suitable for the site. This zone is minimally managed, meaning supplemental native vegetation plantings; thinning from below (i.e., taking out the smaller trees in an over-dense stand) that is intended to increase growth of remaining plants (e.g., where tree growth is suppressed in a densely crowded stand); minimal harvest of trees for personal use (largest/tallest trees should not be harvested); control of invasive/noxious plant species, preferably through non-chemical means. It does not include commercial harvesting of trees (or other vegetation), removal of fallen trees, growing crops, or grazing.

Ephemeral Stream Reach: A reach that does not intersect the water table for any part of the year; flows only in direct response to surface and shallow subsurface runoff following rain or snowmelt events; flow generally occurs for less than 10% of a typical water year (Hedman and Osterkamp, 1982).

Intermittent Stream Reach: A reach that intersects the water table for only part of the year; may have discontinuous sections of surface flow or may become entirely dry during the dry season; continuous flow conditions generally occur for 10% to 80% of a typical water year (Hedman and Osterkamp, 1982).

Minimally Managed Riparian Vegetation: A native vegetation community with a species mixture and density that is within the range of natural variability for the site's ecological potential. The native vegetation community potential should be based on current NRCS ecological site descriptions and/or an equivalent assessment of the potential natural vegetation community. The dominant native tree species in sites with riparian forest should be managed in a way that promotes a trend towards an "old growth" condition over the long-term. "Minimally managed" includes activities such as: supplemental vegetation plantings; thinning from below (i.e. taking out the smaller trees in an over-dense stand) that is intended to increase growth of remaining plants (e.g. where tree growth is suppressed in a densely crowded stand); minimal harvest of trees for personal use (largest/tallest trees should not be harvested); control of invasive/noxious plant species, preferably through non-chemical means. It does not include commercial harvesting of trees (or other vegetation), removal of fallen trees, growing crops, or grazing.

Outer Zone: This is the zone between the core zone and the adjacent land use. A minimum of three variables will determine the width of this zone: site hydrologic soil group, slope, and adjacent land use intensity. Core zone requirements can be applied to outer zone requirements but not vice versa. For example, instead of a filter strip for the outer zone, a native tree and shrub forest could be established if that is preferred, as that is a higher level of water quality protection than a filter strip.

Outer Zone Width Range: The outer zone buffers contain a range of widths. Buffer widths in the outer zone are dependent on a minimum of five variables: stream type, channel width, site hydrologic soil group, slope, and adjacent land use intensity. The guidance on determining a site's outer width range is provided below and is organized by land use.

Perennial stream reach: A reach that has year-round flow in a typical year; the channel intersects the water table for most of the year; continuous flow generally occurs for more than 80% of a typical water year (Hedman and Osterkamp, 1982).

Riparian area (a.k.a. riparian "ecosystem" or "ecotone"): The terrestrial environment that is transitional between aquatic and upland environments. A key defining characteristic is the presence of soils which tend to have greater moisture availability for plant communities than in the adjacent uplands. This area is delineated by features of the natural environment rather than management actions.

Site Potential (SP) Native Plant Community: The native plant community that would occur in a minimally managed condition on a site, e.g., a ponderosa pine forest community, black cottonwood forest community, coyote willow community, etc.

Soil Hydrologic Group: Soil hydrologic groups describe the surface runoff potential for a soil. According to the NRCS (2007): Most of the groupings are based on the premise that soils found within a climatic region that are similar in depth to a restrictive layer or water table, transmission rate of water, texture, structure, and degree of swelling when saturated, will have similar runoff responses. The classes are based on the following factors: intake and transmission of water under the conditions of maximum yearly wetness (thoroughly wet); soil not frozen; bare soil surface; maximum swelling of expansive clays. The slope of the soil surface is not considered when assigning hydrologic soil groups.

The following is a summary of the four soil hydrologic groups from the NRCS. For more details about these groupings, refer to the associated chapter of the NRCS National Engineering Handbook (NRCS, 2007).

Group A—Soils in this group have low runoff potential when thoroughly wet.
Group B—Soils in this group have moderately low runoff potential when thoroughly wet.
Group C—Soils in this group have moderately high runoff potential when thoroughly wet.
Group D—Soils in this group have high runoff potential when thoroughly wet.

The NRCS maintains an interactive soil mapping web application[6] that can be used to help determine the soil hydrologic group(s) for soils occurring in a particular parcel. It is recommended that soils be field verified since the map accuracy of soil boundaries is variable. Hydrologic soil groups present in Spring Flat Creek and associated relative presence percentage and acreage can be found in Table 5 below.

Table 5. Hydrologic soil groups present in Spring Flat Creek and associated relative presence percentage and acreage. Data derived from NRCS Interactive Soil Mapping Web Application - Web Soil Survey.

Spring Flat Creek Hydrologic Soil Group	Percent of Watershed	Acres
A	0	0
B	71	9,372
C	17.3	2,284
C/D	11.7	1,544
D	0	0
Total	100	13,200

Riparian Management Zone (RMZ) and Buffer Width Dependencies

RMZ configuration and buffer width recommendations will vary according to several site-specific factors, some of which are listed below:

- **Stream channel (waterway) width and type (ephemeral, intermittent, and perennial):**
    - In general, the greater the channel width, the wider the buffer is recommended for water quality protection.
    - In general, the longer a section of stream has active water flow during the year, the wider the buffer recommendation for water quality protection.
- **Soil hydrologic group:**
    - There are four soil hydraulic groups – A, B, C, and D. As shown in Table 2 above, Spring Flat Creek Watershed primarily contains hydraulic group B (71%) soils, followed by group C (17.3%) soils, and then a blend of C/D soils (11.7%). There are no group A or singularly D soils in the watershed.
    - The runoff potential of each soil group gets higher with A having the lowest and D having the highest.
    - Within each soil group there is a range of recommended buffer widths dependent on adjacent land use intensity.
- **Adjacent land use intensity**

[6] https://websoilsurvey.sc.egov.usda.gov/App/HomePage.htm

    - In general, the higher the adjacent land use intensity is the wider the buffer recommendation for water quality protection. For example, a conventionally tilled field would require a wider buffer than a direct seeded or no-tilled field, and a livestock winter feeding area would require a wider buffer than a seasonal grazing pasture.
- **Slope**
    - The slope of a site can significantly influence overland pollutant transport and water infiltration rates. In general, the steeper the slope the wider the buffer recommendation for water quality protection.

Riparian Management Zone (RMZ) and Buffer Width Recommendations

To meet water quality standards, Ecology will work with partners to install the minimum width buffers identified in this section, along both sides of Spring Flat Creek streams. The following tables are buffer width recommendations developed using best available science and are consistent with the Voluntary Clean Water Guidance for Agriculture.

General RMZ and Buffer Width Recommendations:

Outer zone buffer width range recommendations specific to dryland crop production and livestock feeding, pasture and grazing can be found in the subsequent section. For all other land uses, the following two tables should be used for RMZ and buffer width recommendations. Tables 6 and 7 below show the RMZ options for stream reaches. The preferred options are highlighted in green; these options will provide the highest water quality protection and habitat value. However, where that option cannot be achieved, alternative options are provided in yellow.

Table 6. Spring Flat Creek Riparian Management Zone (RMZ) Options for Perennial and Intermittent Stream Reaches

RMZ Options	Channel Width	RMZ Options (Buffer Requirements)
Preferred Option	All Channel Widths	**Core zone:** ≥150ft site potential (SP) forest
Alternative Option	< 5ft	**Core zone:** ≥50ft minimally managed site potential (SP) forest **Outer zone**: 0-100ft filter strip, depending on soils, slope, and land use intensity
	5 to 30ft	**Core zone**: ≥60ft minimally managed site potential (SP) forest **Outer zone**: 0-100ft filter strip, depending on soils, slope, and land use intensity
	30 to 150ft	**Core zone:** ≥75ft minimally managed site potential (SP) forest **Outer zone:** 0-100ft filter strip, depending on soils, slope, and land use intensity

Table 7. Spring Flat Creek Riparian Management Zone (RMZ) Options for Ephemeral Stream Reaches

RMZ Options	Channel Width	RMZ Options (Buffer Requirements)
Preferred Option	All Channel Widths	**Core zone:** ≥150ft site potential (SP) forest
Alternative Option	All Channel Widths	**Core zone**: ≥35ft minimally managed site potential (SP) forest **Outer zone**: 0-115ft filter strip, depending on soils, slope, and land use intensity

Dryland Crop Production Outer Zone Width Range Determining Factors: A minimum of five variables should be used for determining outer zone buffer widths: stream type, channel width, site hydrologic soil group, slope, and adjacent land use intensity. The outer zone buffer recommendations should be used on a site-by-site basis when core zone buffers have been shown to not be fully protective of water quality.

- **Land use Intensity - Soil Tillage Intensity Rating (STIR) –** The Natural Resources Conservation Service (NRCS) uses the soil tillage intensity rating (STIR) value to provide a relative indication of tillage-based soil disturbance. To calculate the STIR value, NRCS utilizes the speed, depth, surface disturbance percent and tillage type parameters to calculate a tillage intensity rating for the system used in growing a crop or rotation. STIR ratings show the differences in the degree of soil disturbance among tillage practices. Lower numbers indicate less overall soil disturbance.

- **Hydrologic Soil Group –** There are four soil hydraulic groups – A, B, C, and D. The runoff potential of each soil group gets higher with A having the lowest and D having the highest runoff potential.
- **Slope –** where slopes are greater than 8% occur within 150 feet of the stream, increase the filter strip width by an additional 10 feet.

The following tables incorporate all five variables for determining outer zone buffer widths for dryland crop production.

Dryland Crop Production RMZ Core Zone and Outer Zone Width Range Recommendations

The following tables have incorporated the minimum outer zone width variables to consider and contain the minimum core zone recommendations. The first table is for perennial and intermittent stream reaches and the second table is for ephemeral stream reaches. Please note that core zone widths are consistent with the tables in the previous section. The outer zone buffer recommendations should be used on a site-by-site basis when core zone buffers have been shown to not be fully protective of water quality.

Table 8. Dryland Crop Production RMZ Core Zone and Outer Zone Width Range Recommendations on Perennial and Intermittent Stream Reaches

Channel Width	Core and Outer Zone Widths	Outer Zone Filter Strip Width				
		STIR	Soil Hydro Group A	Soil Hydro Group B	Soil Hydro Group C	Soil Hydro Group D
< 5ft	**Core zone:** ≥50ft minimally managed site potential (SP) forest **Outer zone:** 0-50ft filter strip, depending on STIR, soils, and slope, use table on right to find recommended outer zone width	0-30 ft	0 ft	0 ft	0 ft	0 ft
		30-55 ft	5 ft	5 ft	15 ft	15 ft
		55-80 ft	15ft	15ft	25ft	25ft
		greater than 80	30ft	30ft	40ft	40ft
5 – 30ft	**Core zone:** ≥60ft minimally managed site potential (SP) forest **Outer zone:** 0-50ft filter strip, depending on STIR, soils, and slope, use table on right to find recommended outer zone width	0-30	0ft	0ft	0ft	0ft
		30-55	5ft	5ft	15ft	15ft
		55-80	15ft	15ft	25ft	25ft
		greater than 80	30ft	30ft	40ft	40ft
30 – 150ft	**Core zone:** ≥75ft minimally managed site potential (SP) forest	0-30	0ft	0ft	0ft	0ft
		30-55	5ft	5ft	15ft	15ft
		55-80	15ft	15ft	25ft	25ft

For the above table, please note where slopes >8% occur within 150ft of the stream, increase the filter strip by an additional 10ft.

Table 9. Dryland Crop Production RMZ Core Zone and Outer Zone Width Range Recommendations on Ephemeral Stream Reaches

Channel Width	Core and Outer Zone Widths	STIR	Soil Hydro Group A	Soil Hydro Group B	Soil Hydro Group C	Soil Hydro Group D
All Channel Widths	**Core zone**: ≥35ft minimally managed site potential (SP) forest **Outer zone:** 0-50ft filter strip, depending on STIR, soils, and slope, use table on right to find recommended outer zone width	0-30	0ft	0ft	0ft	0ft
		30-55	5ft	5ft	15ft	15ft
		55-80	15ft	15ft	25ft	25ft
		greater than 80	30ft	30ft	40ft	40ft

For the above table, please note where slopes >8% occur within 150ft of the stream, increase the filter strip by an additional 10ft.

Livestock Feeding, Pasture, and Grazing RMZ Core Zone and Outer Zone Width Range Determining Factors

A minimum five variables should be used for determining outer zone buffer widths: stream type, channel width, site hydrologic soil group, slope, and adjacent land use intensity.

- **Land use Intensity –** Land use intensity is categorized as moderate or heavy for this section. Heavy intensity livestock land use practices generally will need a larger buffer for water quality protection than moderate intensity land use practices. Examples of moderate intensity livestock land use practices include grazing under a management plan designed to maintain or improve soil, forage, and livestock health. Examples of high intensity grazing include areas where winter feeding occurs; manure storage areas; and grazing without a management plan designed to improve soil, forage, and livestock health.
- **Hydrologic Soil Group –** There are four soil hydraulic groups – A, B, C, and D. The runoff potential of each soil group gets higher with A having the lowest and D having the highest runoff potential.
- **Slope –** where slopes greater than 8% occur within 150 feet of the stream, increase the filter strip width by an additional 10 feet.

The following tables incorporate all five variables for determining outer zone buffer widths for livestock feeding, pasture, and grazing. Please note, at a minimum, permanent exclusion fencing must be installed on the upland edge of the core zone and may need to be installed to prevent access to filter strip areas where needed. Please see the section on Livestock BMPs for additional information on fencing.

Livestock Feeding, Pasture, and Grazing RMZ Core Zone and Outer Zone Width Range Recommendations

The following tables have incorporated the minimum outer zone width variables to consider and contain the minimum core zone recommendations. Please note, at a minimum, permanent exclusion fencing must be installed on the upland edge of the core zone and may need to be installed to prevent access to filter strip areas where needed. The first table is for perennial and intermittent stream reaches and the second table is for ephemeral stream reaches. Each table has core zone and outer zone width recommendations. Please note that core zone widths are consistent with the tables in the previous section.

Table 10. Livestock Feeding, Pasture, and Grazing RMZ Core Zone and Outer Zone Width Range Recommendations on Perennial and Intermittent Stream Reaches

Channel Width	Core and Outer Zone Widths	Outer Zone Filter Strip Width				
		Livestock Intensity	Soil Hydro Group A	Soil Hydro Group B	Soil Hydro Group C	Soil Hydro Group D
< 5ft	**Core zone:** ≥50ft minimally managed site potential (SP) forest **Outer zone:** 0-60ft filter strip, depending on land use intensity, grazing plan, soils, and slope, use table on right to find recommended outer zone width	Moderate	0ft	0ft	0ft	0ft
		High	25ft	25ft	50ft	50ft
5 to 30ft	**Core zone:** ≥60ft minimally managed site potential (SP) forest **Outer zone:** 0-50ft filter strip, depending on STIR, soils, grazing plan, and slope, use table on right to find recommended outer zone width	Moderate	0ft	0ft	0ft	0ft
		High	15ft	15ft	40ft	40ft
30 to 150ft	**Core zone:** ≥75ft minimally managed site potential (SP) forest **Outer zone:** 0-75ft filter strip, depending on STIR, soils, grazing plan, and slope, use table on right to find recommended outer zone width	Moderate	0ft	0ft	0ft	0ft
		High	5ft	5ft	25ft	25ft

For the above table, please note where slopes >8% occur within 150ft of the stream, increase the filter strip by an additional 10ft.

Table 11. Livestock Feeding, Pasture, and Grazing RMZ Core Zone and Outer Zone Width Range Recommendations on Ephemeral Stream Reaches

Channel Width	Core and Outer Zone Widths	Livestock Intensity	Soil Hydro Group A	Soil Hydro Group B	Soil Hydro Group C	Soil Hydro Group D
All Channel Widths	**Core zone (50ft)**: ≥35ft minimally managed site potential (SP); forest; ≥15ft can be filter strip or minimally managed site potential (SP); forest **Outer zone:** 0-100ft filter strip depending on land use intensity, soils, grazing management plan, and slope, use table on right to find recommended outer zone width	Moderate	0ft	0ft	0-25ft Range see guidance below table	0-50ft Range see guidance table
		High	25ft	25ft	50ft	50ft

For the above table, please note where slopes >8% occur within 150ft of the stream, increase the filter strip by an additional 10ft.

Soil hydrologic group C and D range for moderate livestock intensity on ephemeral streams: If no grazing occurs when there is water in the stream, and there are no other water quality concerns associated with the site, then there may not be a need to include any outer zone filter strip for water quality protection assuming the core zone requirements have been met. If grazing occurs when there is water in the stream, an outer zone filter strip should be utilized as identified in the table for water quality protection.

For additional information on livestock best management practices, including off-stream water, stream crossings, and heavy use area placements relative to the core and outer buffer zones see: "*Chapter 10 - Livestock Management: Pasture & Rangeland Grazing", of the Voluntary Clean Water Guidance for Agriculture (Ecology, 2022).*

Amounts of technical and financial assistance needed

Implementation of this STI will require significant technical and financial assistance. Ecology is responsible for ensuring water quality standards are met, however, maintaining strong relationships among watershed partnerships will be critical to meeting the goals of this STI. This section covers the estimated technical and financial assistance needed for implementation targets as well as available funding opportunities and watershed partners.

Estimated Costs

The estimates below represent generalized cost estimates associated with the best management practices identified in this plan, however they are generalized estimates. The total estimated cost to implement this plan as written is $8,606,195. Estimates are organized by each land use anticipated over the full 10-year implementation period for this Straight to Implementation strategy. The 15-year contract payments described below are fully incorporated in the 10-year cost estimate.

Dryland Crop Production - Financial and technical assistance to restore the estimated 345 acres of dryland agricultural production within Spring Flat Creek riparian areas is estimated to cost approximately $5,117,365. The costs associated with this effort include: 15-year buffer program rental rates, riparian planting and maintenance, bank stabilization, permits, and project management staff time. These estimates do not consider conservation tillage improvements for producers that wish to transition to a lower STIR system, which may be appealing to producers due to the narrower outer zone buffer requirements for conservation tillage practices as noted in the previous section.

Table 12. Financial and technical assistance needed to restore dryland agricultural production in Spring Flat Creek riparian areas.

Dryland Crop Production	Units	Rate/Unit	Cost/Year	15 Year Contract	Total
15 yr. buffer incentive payments (acres) Commodity Buffer Program (avg rental rate)	345	$350.00	$120,750.00	$1,811,250.00	$1,811,250.00
Riparian restoration & maintenance (acres)	345	$7,367.00		$2,541,615.00	$2,541,615.00
Cultural resources (sites, avg 7.5 acres)	46	$4,000.00		$184,000.00	$184,000.00
Bank stabilization (150’=4500=30/ft.) Total mainstem=50k’/2=25k’ estimated at 59%	14750	$30.00		$442,500.00	$442,500.00
Staff time (sites, avg 7.5 acres)	46	$3,000.00		$138,000.00	$138,000.00
Total estimated cost					$5,117,365.00

Livestock Pasture, Feeding, and Rangeland - Financial and technical assistance to restore the estimated 88 acres of livestock pasture, feeding, and rangeland land use within Spring Flat Creek riparian areas is estimated to cost approximately $2,064,868. The costs associated with this effort include: 15-year buffer program rental rates, riparian planting and maintenance, additional livestock BMPs, bank stabilization, permits, and project management staff time.

Table 13. Financial and technical assistance needed to restore livestock pasture, feeding and rangeland land use in Spring Flat Creek.

Livestock	Units	Rate/Unit	Cost/Year	15 Year Contracts	Total
Buffer incentive payments (acres) avg CCRP/CREP	88	$90.00	$7,920.00	$118,800.00	$118,800.00
Livestock fencing	63,888	$6.50		$415,272.00	$415,272.00
Riparian restoration & maintenance (acres)	88	$7,367.00		$648,296.00	$648,296.00
Bank stabilization (25k estimated X 15%)	3750	$30.00		$112,500.00	$112,500.00
Off-stream watering (avg 1.5/site) 10k each	33	$10,000.00		$330,000.00	$330,000.00
Other livestock BMPs (ballpark average per site)	22	$12,000.00		$264,000.00	$264,000.00
Cultural resources (~22 sites)	22	$4,000.00		$88,000.00	$88,000.00
Staff time (sites, avg 22 sites)	22	$4,000.00		$88,000.00	$88,000.00
Total estimated cost					$2,064,868.00

Perennial Grasses - Financial and technical assistance to restore and enhance the estimated 47 acres of perennial/invasive grass riparian areas in Spring Flat Creek is estimated to cost approximately $589,899. The costs associated with this effort include: 15-year buffer program rental rates, riparian planting and maintenance, bank stabilization, permits, and project management staff time.

Table 14. Financial and technical assistance needed to restore perennial grass riparian areas in Spring Flat Creek.

Perennial Grasses	Units	Rate/Unit	Cost/Year	15 Year Contracts	Total
Buffer incentive payments (acres) avg CCRP/CREP	47	$90.00	$4,230.00	$63,450.00	$63,450.00
Riparian restoration & maintenance (acres)	47	$7,367.00		$346,249.00	$346,249.00
Bank stabilization (25k estimated X 15%)	3500	$30.00		$105,000.00	$105,000.00
Cultural resources (47/5 for site estimate)	9.4	$4,000.00		$37,600.00	$37,600.00
Staff time (47/5 for site estimate)	9.4	$4,000.00		$37,600.00	$37,600.00
Total estimated cost					$589,899.00

Impervious Surfaces/Roadways – Financial and technical assistance to implement BMPs for impervious surfaces will largely be dependent on local jurisdictional requirements for new and redevelopment projects and is incredibly difficult to estimate given the scope, scale, and outlook for these activities. The Stormwater Management Manual for Eastern Washington (SWMMEW)[7], provides guidance for the measures necessary to control the quantity and quality of stormwater in eastern Washington. Local jurisdictions should use this manual to set stormwater requirements for new development and redevelopment projects. Land developers and designers should use this manual to design permanent stormwater control plans, develop construction stormwater pollution prevention plans, and determine stormwater infrastructure BMPs for water quality protection. Businesses should use this manual to help design their stormwater pollution prevention plans.

Ecology's Stormwater Financial Assistance Program (SFAP) grant is designed to fund stormwater projects and activities that have proven effective at reducing impacts from existing infrastructure and development and enhance existing stormwater programs. Hundreds of stormwater infrastructure projects have been funded through this program. Parties interested in cost estimates for these BMPs are encouraged to investigate this program's recently funded projects for BMP cost estimates.

Non-Stream Stormwater Conveyance Features - Financial and technical assistance to buffer (15-foot) the estimated 73.8 miles (134 acres) of non-stream stormwater conveyance features within Spring Flat Creek is estimated to cost approximately $834,063.00. The costs associated with this effort include: 15-year buffer program rental rates, native perennial grass establishment, and project management staff time.

[7] https://fortress.wa.gov/ecy/ezshare/wq/Permits/Flare/2019SWMMEW/Content/Resources/DocsForDownload/2019SWMMEW_8-13-19.pdf

Table 15. Financial and technical assistance to buffer the non-stream stormwater conveyance features within Spring Flat Creek.

Non-stream stormwater conveyance features	Units	Rate/Unit	Cost/Year	15 Year Contracts	Total
Buffer incentive payments dryland (acres) Commodity Buffer Program	88.44	$350.00	$30,954.00	$464,310.00	$464,310.00
Buffer incentive payments livestock (acres) avg CCRP/CREP	22.78	$90.00	$2,050.20	$30,753.00	$30,753.00
Native perennial grass establishment	134	$2,500.00	$335,000.00		$335,000.00
Staff time (134/5 for site estimate)	26.8	$4,000.00			$4,000.00
Total estimated cost					$834,063.00

BMP Funding Opportunities

Palouse River Watershed Regional Conservation Partnership Program (RCPP) - In 2021, USDA's Natural Resources Conservation Service (NRCS) renewed the Palouse River Watershed (WRIA 34) Implementation Partnership and provided an additional $5.5 million to improve water quality, soil health, and habitat in the Palouse River Watershed. This builds on the $5.5 million that was awarded to the Partnership at the program's inception in 2014.

Commodity Buffer Program – Administered by the Palouse Conservation District, this program provides annual rental payments for buffers on agricultural lands. The program is unique in that its rental rates are based on adjacent crop values. Additional incentive payments are provided for incorporating native woody vegetation into the buffer.

Conservation Reserve Enhancement Program (CREP) - Participants of CREP practices are reimbursed for 100% of the costs to establish the buffer and receive an annual rental payment per acre enrolled, for
10 to 15-year contracts. CREP is funded by the USDA Farm Service Agency and the State of Washington. The federal government contributes about 90% of the total costs, while the State covers the remaining 10%.

Continuous Conservation Reserve Program (Continuous CRP) - The Continuous-CRP program is like CREP. It provides cost-share to producers to implement riparian buffers on agricultural land. Washington State does not contribute to the Continuous CRP program. Therefore, the Continuous CRP program pays only 90% cost-share for fencing, livestock water, and tree planting and a smaller rental payment per acre over the 10 to 15-year contract. The main difference between CREP and Continuous CRP is that CREP is only available on streams associated where salmon or steelhead are present. As a result, Continuous CRP may be a valuable program for Spring Flat Creek landowners located along ineligible CREP reaches.

Ecology Centennial / 319 grants - The Centennial Clean Water Fund (CCWF) is Washington state funding. The CCWF provides grants for water quality infrastructure and nonpoint source pollution projects. Eligible nonpoint projects include stream restoration and buffers, conservation tillage cost-share, on-site septic repair and replacement, land acquisition, water quality monitoring, education, and outreach, among others. In addition, the federal Environmental Protection Agency (EPA) provides Section 319 grant funds to Washington State. The Section 319 program offers funds for nonpoint source pollution control projects similar to the state Centennial program. These two funding sources are combined into a single grant funding cycle. With these funds, Ecology has paid for extensive riparian planting throughout the state. The Palouse CD has received several grants for conservation tillage cost-sharing, water quality monitoring, livestock BMPs, bank stabilization, and plant riparian plantings within their district.

- **Spring Flat Creek Riparian Restoration and Conservation Program** – At the time of writing this STI, the Department of Ecology and the Palouse and Whitman conservation districts were working on a riparian pilot program for Spring Flat Creek Watershed. That program was successfully funded and will compensate farmers for riparian land taken out of production and restored with native vegetation. The program will also be designed to fund all implementation costs including potted stock plants, irrigation, and maintenance. Contract lengths discussed is 15 years. Implementation of this program will begin in 2024.

Environmental Quality Incentive Program (EQIP) - The Environmental Quality Incentives Program (EQIP) is designed to promote agricultural production, forest management, and environmental quality. Through EQIP, the Natural Resources Conservation Service (NRCS) provides financial assistance to eligible farmers and ranchers to address soil, water, and air quality, wildlife habitat, surface and groundwater conservation, energy conservation, and related natural resource concerns. The program requires the development of lists showing practices eligible for payment, allowed payment rates, criteria used to rank applications, and a description of the program and the application process. This is a locally driven process where "local work groups" made up of local governments, agencies, and agricultural producers identify specific annual priorities for funding. Millions of dollars are available to each state to implement regional priorities identified by the work groups. Riparian protection and planting are typically priorities for the Palouse Watershed local working group.

Ecology Direct Implementation Funds (DIF) - The Department of Ecology has identified a small amount of the federal 319 funds it receives for the purpose of directly implementing TMDL or STI plans. These are small to large grants ranging from $10,000 to more than $1 million to focus on specific implementation actions. The projects are sponsored by staff to achieve a specific water quality objective. Often, this involves funding riparian protection and planting. The Spring Flat Creek STI may utilize Direct Implementation Funds to implement BMPs if funds are available. At the writing of this document, Ecology is working with Palouse and Whitman Conservation Districts on a pilot project to fund an approximate $600,000 grant which will enable producers and landowners in SFC to enroll in a program that pays rental payments for riparian land taken out of production and restored with native trees and shrubs. Contracts for that program are planned to be 15 years in length at an approximate payment of $300/acre. This pilot program will pay for all the costs associated with the implementation and maintenance of the riparian buffers.

Ecology Coastal Protection (Terry Husseman) grants - The Coastal Protection (Terry Husseman) grants are small grants (less than $50,000) available for specific on-the-ground actions proposed by partners. The coastal protection account was created to utilize money collected via water quality penalties for water quality protection. Availability of funds varies depending on recent violations and penalties.

Natural Resource Investment (NRI) grant funds - The Washington Conservation Commission has funds available for small projects proposed by conservation districts. These funds have gone toward a variety of BMPs throughout the state.

Stormwater Financial Assistance Program (SFAP) grants – SFAP is designed to fund stormwater projects and activities that have proven effective at reducing impacts from existing infrastructure and development and enhance existing stormwater programs. Stormwater facility projects and a limited set of stormwater activities project types are eligible for SFAP funding.

Watershed Partners

Ecology staff will continue to work on increasing the number and diversity of stakeholders engaged in the Spring Flat Creek Watershed, as well as continue building and maintaining positive relationships with existing partners. Engaged watershed stakeholders and positive partnerships are the most critical component to cultivating the synergistic environment needed for achieving significant water quality improvements. The Ecology STI lead in the Spring Flat Creek Watershed has already had discussions with partners in the watershed and will continue to discuss the BMPs identified in this document and provide site specific guidance to ensure appropriate implementation to achieve STI objectives.

City of Colfax – The City of Colfax, the only municipality located in the Spring Flat Creek Watershed, will be an important watershed partner to implement relevant BMPs within the city limits. Ecology will actively work with the City of Colfax to identify areas that can be improved for water quality, specifically within their stormwater infrastructure and when any new development occurs.

Palouse Conservation District – The Palouse Conservation District (CD) has been working to implement conservation tillage, riparian plantings, bank stabilizations, livestock BMPs, water quality monitoring, and education and outreach throughout the Palouse Watershed. They are knowledgeable about water quality, work effectively with producers, and have demonstrated a willingness to implement needed BMPs. The Palouse CD also administers several grants and funding programs, including RCPP, CREP, Ecology's Riparian Buffer Program, and Commodity Buffer Programs.

Pacific Northwest Direct Seed Association – Is a producer non-profit group that promotes conservation tillage practices. They also manage the Farmed Smart program that works to certify farms that implement specific conservation tillage practices. They will likely be a partner in portions of the watershed where dryland crops are produced adjacent to surface water.

Washington Department of Fish and Wildlife – WDFW is generally consulted on bank stabilization projects in the Palouse Watershed. They may be partners on future projects in the watershed.

Washington State Department of Transportation – WSDOT maintains Hwy 195 which runs through Spring Flat Creek. WSDOT and Ecology have been working in partnership to address polluted runoff entering stormwater infrastructure throughout the Palouse, as part of the North Fork Palouse TMDLs action items associated with Appendix 3 of their Municipal Permit. Current efforts focus on addressing TSS/turbidity/nitrogen associated with adjacent erosion (run-on), including sediment delivery from farming activities. Ecology will strive to continue that work with WSDOT to include the Spring Flat Creek Watershed. Discussions between WSDOT and agricultural producers on responsibilities, maintenance, and implementation efforts of those areas are an important aspect of this STI, as much of the right of way areas in Spring Flat Creek are in agricultural production.

Whitman Conservation District – The Whitman Conservation District (CD) has been working to implement riparian plantings, livestock BMPs, bank stabilizations, and education and outreach throughout Palouse Watershed. They are knowledgeable about water quality, work effectively with producers, and have demonstrated a willingness to implement needed BMPs. The Whitman CD also administers several grants and funding programs, including partnering on Ecology's Riparian Buffer Program for SFC.

Whitman County Public Works – Whitman County public works department maintains several miles of county roads within Spring Flat Creek. Similar to Hwy 195, discussions between the

Whitman County Public Works department and agricultural producers on responsibilities, maintenance, and implementation efforts within those areas are an important aspect of this STI, as much of the right of way areas in Spring Flat Creek are in agricultural production.

Whitman County Natural Resource Conservation Service – The NRCS office in Whitman County has talented and dedicated staff that provides technical assistance to agricultural producers on water quality protection. Their continued service to producers will be required to achieve STI objectives.

Whitman County Farm Service Agency – The FSA funds federal riparian buffer programs such as the federal portion of the Continuous Conservation Reserve Program (CCRP) and the federal portion of the Conservation Reserve Enhancement Program (CREP). These programs will be crucial for STI implementation.

Outreach and Education

Public Information/outreach - Ecology staff will work with the partners in the watershed to provide landowners pertinent information on water quality issues, appropriate BMPs, and sources of funding. The outreach will include landowner workshops, personal site visits, and other unique ways to get information to the people who need it. Staff will also attend CD board meetings to discuss the objectives of the STI and ways to reach out to the landowners in the watershed that will result in effective technical and financial assistance.

To date, Ecology has held one formal meeting with Palouse Conservation District and Whitman Conservation District. Ecology has had several informal conversations with District staff about this plan's details. Those initial conversations led to the Palouse Conservation District applying for and receiving a $345,445 Ecology grant specific to the implementation of this STI. Ecology and the Palouse and Whitman conservation districts have been meeting on developing the Spring Flat Creek Riparian Restoration and Conservation Program to make it more economical for producers to implement riparian forest buffers consistent with this STI. At the end of 2023 that project proposal was funded and will begin implementation in 2024. The program will compensate farmers for the land taken out of production and restored with native vegetation.

Watershed Evaluations - Ecology staff will perform watershed evaluations at least once annually for the next 10 years. Each evaluation will identify two to five parcels having water quality concerns for contact. The evaluations will be performed in early spring (March or April) and in the fall in some years (September or October). These efforts allow Ecology staff to evaluate and prioritize non-point source pollution and direct outreach efforts accordingly. Ecology intends to contact all landowners in the watershed that need to implement water quality improvements to protect water quality. Ecology conducted a thorough watershed evaluation of Spring Flat Creek in the springs of 2022 and 2023.

Contacting Landowners - Ecology will contact landowners who need to take steps to protect surface water. They will be provided information on the BMPs identified in this STI plan, and Ecology will offer technical assistance and will be available for site visits. Those landowners will be given an opportunity to proactively seek technical and financial assistance from Ecology and its partners. When Ecology believes it will aid in achieving implementation, partners such as the conservation district may make first contact with landowners. Ecology has a working relationship with the conservation district that ensures appropriate information is shared and the BMPs detailed in this plan are implemented. Ecology plans to begin contacting landowners in June 2023, based on that year's evaluation.

Formal Compliance Actions - Despite the best efforts of Ecology and partners in the watershed, some landowners may be unwilling to perform the steps needed to protect water quality at their property. It then becomes Ecology's responsibility to evaluate whether their activities are causing or have the potential to cause pollution in violation of the state's Water Pollution Control Act (RCW 90.48). In these situations, Ecology will pursue enforcement steps needed to gain compliance.

Project Implementation Schedule

A schedule for implementing the nonpoint measures identified in this work plan is provided to ensure compliance will be achieved within 10 years of start of STI work in the watershed, or for pollutants such as temperature, where compliance will take longer because of natural processes such as tree growth, all implementation actions will be completed within 10 years. To ensure Ecology meets the 10-year target, each STI project includes a 3-year and a 7-year progress review to determine whether implementation is proceeding on schedule and to implement use of further measures if it is not. A considerable amount of time and resources goes into each water quality improvement project to get it fully implemented. Additionally, many grant funds and program enrollment processes may take several years.

Riparian Restoration – Approximately 480 acres of Spring Flat Creek riparian areas need restoration to some extent, the majority is currently in dryland crop production, followed by livestock, then perennial/invasive grasses. Depending on the stream reach, several BMPs may be required for riparian restoration to be successful, including livestock BMPs, invasive vegetation control, and bank stabilization. Also dependent on the stream reach type and location, a combination of perennial herbaceous vegetation and/or woody vegetation may be installed to protect water quality. The following table represents the timeline goals associated with Spring Flat Creek riparian restoration.

Table 16. Riparian Restoration Timeline Goals for Spring Flat Creek.

Year	Calendar Year	Riparian Restoration (acres)
1	2024	20
2	2025	30
3	2026	40
4	2027	50
5	2028	50
6	2029	50
7	2030	60
8	2031	60
9	2032	60
10	2033	60
Total	10 years	480

Livestock BMPs – Approximately 22 livestock sites are located in Spring Flat Creek, impacting approximately 88 acres of Spring Flat Creek riparian areas. The 88 acres associated with this land use type is included in the riparian restoration timeline above, however, a site dependent combination of associated livestock BMPs such as exclusion fencing, off-stream watering, heavy use areas, and livestock crossings will be needed on most of these sites. The following table represents the timeline goals associated with implementing livestock BMPs on the estimated 22 sites impacting water quality in Spring Flat Creek.

Table 17. Livestock BMP implementation timeline goals for Spring Flat Creek.

Year	Calendar Year	Site Plans Developed and Implemented
1	2024	1
2	2025	2
3	2026	2
4	2027	2
5	2028	2
6	2029	2
7	2030	2
8	2031	3
9	2032	3
10	2033	3
Total	10 years	22

Non-stream Stormwater Conveyance Features – Approximately 134 acres adjacent to non-stream stormwater conveyance features, such as roadside ditches, will need to have land use setbacks and appropriate buffers installed to protect downstream water quality. 15-foot-wide perennial grass buffers is recommended for these areas. The following table represents the timeline goals associated with achieving these buffers.

Table 18. Buffer installation timeline goals.

Year	Calendar Year	Buffers Installed (acres)
1	2024	8
2	2025	14
3	2026	14
4	2027	14
5	2028	14
6	2029	14
7	2030	14
8	2031	14
9	2032	14
10	2033	14
Total	10 years	134

Estimated Load Reductions through Buffer Implementation

An STI strategy does not include an initial water quality study to establish baseline conditions and to model load reductions needed. Instead, the objective here is to eliminate pollution from all the identified sources, not just from enough of them to achieve compliance with water quality standards. Buffer implementation estimates provided in the previous section are intended to treat the entire watershed. Below are the estimated load reductions anticipated for temperature, pH, and DO from buffer implementation.

Estimated Load Reductions for Temperature

The effectiveness of a Riparian Management Zone (RMZ) at inhibiting stream temperature increases through channel shading is a function of channel orientation (e.g., north-south vs. east-west), channel width, vegetation height, and canopy density, as well as the width of the vegetation band.

In eastern Washington, for channels less than 30 feet wide that have forested riparian potential, it is estimated that:

- A 60-foot-wide stand of mature, native riparian forest can provide 95% of site potential shading, for any stream channel orientation (Ecology, May 2022).
- Ecology has measured stream channel widths at various locations using aerial imagery via GIS, and most Spring Flat Creek stream channels are less than 30-foot bankfull width.

A 60-foot-wide stand of riparian trees and shrubs will be the ultimate goal where stream flow occurs during at least a portion of the critical period, however a narrower buffer width of 50 feet may be installed if the stream channel is less than five feet wide. Approximately 480 acres of trees and shrubs will be planted as a result of this STI. Additional water quality protection in the form of an herbaceous filter strip may be needed depending on producer STIR and soil hydrologic group. Trees and shrubs will not be required in the filter strip. Load reductions will not be fully achieved until vegetation is established (50 to 60+ years).

Estimated Load Reductions for pH and DO

The effectiveness of an RMZ at capturing pollutants (nutrients and sediment) in runoff is largely a function of soil characteristics, in particular, the ability of a soil to infiltrate runoff.

In eastern Washington, it is estimated that:

- A buffer width of 35 to 50 feet is sufficient to infiltrate greater than 95% of upland runoff (in the form of non-concentrated flows) on Hydrologic Group A and B soils.
- A buffer width of 50 to 75 feet is sufficient to infiltrate greater than 95% of upland runoff (in the form of non-concentrated flows) on Hydrologic Group C and D soils.

These estimates were derived from the Riparian Management Zones for agriculture chapter in Ecology's Voluntary Clean Water Guidance for Agriculture Handbook (Ecology, 2022).[8]

Measurable Milestones

Specific milestones are included in the BMP implementation schedules. To ensure progress is being made, at the end of every other year beginning 2025, Ecology will convene watershed stakeholders to discuss progress towards meeting the BMP implementation schedule. Ecology and stakeholders will calculate acres of riparian restoration and the other buffer statistics identified above to evaluate progress toward meeting STI goals. If implementation targets are not on track, Ecology will work with partners to identify solutions reaching those targets.

Progress Indicators

Ultimately the goal of this STI is to restore degraded riparian areas and establish system potential vegetation and shade throughout 100% of the stream corridors in tandem with the other BMPs listed by land use. Implementation of riparian and the land use specific BMPs will, overtime, reduce temperature and pH, and increase DO. Progress towards meeting water quality standards will be measured through the monitoring component of this plan. In turn, progress toward meeting the riparian protection and planting objectives identified in this STI will determine if implementation is proceeding on schedule and enable changes to the strategy if necessary. In summary, Ecology will track and evaluate the following key components of the plan:

[8] https://apps.ecology.wa.gov/publications/documents/2010008.pdf

- Number of projects implemented by land use including fencing and planting information,
- Acres of riparian area protected by land use,
- Acres of conventional tillage converted to conservation tillage (Direct Seed/No-till),
- Education and outreach efforts – resulting participation/interest of landowners,
- Use of funding sources to implement necessary protection and restoration,
- Continued availability of funding options,
- Work of partners to achieve STI goals,
- Any identified obstacles and adaptive management strategies.

Monitoring Component

The Palouse Conservation District (PCD) operates a robust monitoring program throughout the Palouse Watershed. They are currently monitoring for temperature, DO, and pH, among other parameters in Spring Flat Creek under an approved Quality Assurance Project Plan (QAPP). Currently, PCD staff are monitoring monthly at this monitoring station, which is located on the lower mainstem near the confluence with the Palouse River.

During the development of this plan, conversations with Palouse CD and Ecology led to the development of an Ecology funded grant application including a more robust monitoring component in Spring Flat Creek. As of spring 2024, that grant contract had been finalized and recently activated, and the Palouse CD anticipated working with Ecology on the relevant QAPP in the coming months to hopefully begin collecting data under it later that fall. It is anticipated that in addition to the existing monitoring station, that two additional monitoring stations will be installed in to be determined locations for a more focused effectiveness monitoring effort. While the QAPP for this supplemental monitoring component is early in its development, an excerpt taken from the language used in the grant application is below:

> "As a first step we will amend our existing Quality Assurance Project Plan (QAPP) to include a continuous monitoring (15-minute data collection) station at the mouth of Spring Creek. Water quality data collection will include 15-minute measurements of stage height, water temperature, dissolved oxygen, specific conductivity, pH, and turbidity. In addition, monthly grab samples will be collected and processed at Anatek Labs in Moscow. The grab samples will be analyzed for Suspended Sediment Concentration (SSC), Total Phosphorous (TP), Orthophosphate (OP), Ammonia, and Nitrate/Nitrite. The data collected with be stored and cleaned in PCD's WISKI database and uploaded annually to Ecology's Environmental Information Management system" (Spring Flat Creek WQC-2024-PaloCD-00045, PCD 2023).

Ecology staff will continue to work with PCD staff on effectiveness monitoring within Spring Flat Creek as a component to this STI, but it will take time for some of the benefits of implementation to be observable in the stream. Temperature, for example, is not likely to change rapidly given that tree and shrub planting in this arid watershed will need time to grow before they can provide shade.

Throughout the 10-year period of this project, we will coordinate with partners to collect BMP effectiveness data to determine water quality condition. Ecology intends to complete a 10-year comprehensive Spring Flat Creek STI report. The report will incorporate the effectiveness monitoring data and any additional data we determine is needed to evaluate whether Spring Flat Creek is on track to meet standards. The report will also detail the implementation actions completed during the 10-year STI effort.

Reference Materials

Natural Resources Conservation Services, United States Department of Agriculture. “Field Office Technical Guide”. https://www.nrcs.usda.gov/resources/guides-and-instructions/field-office-technical-guides.

Water Quality Program, Washington State Department of Ecology. “Chapter 1 Cropping Methods: Tillage and Residue Management.” Voluntary Clean Water Guidance for Agriculture, Publication Number 20-10-008a, Ecology, 2022.

Water Quality Program, Washington State Department of Ecology. “Chapter 10 Livestock Management: Pasture and Rangeland Grazing.” Voluntary Clean Water Guidance for Agriculture, Publication Number 20-10-008d, Ecology, 2022.

Water Quality Program, Washington State Department of Ecology. “Chapter 12 Riparian Areas & Surface Water Protection.” Voluntary Clean Water Guidance for Agriculture, Publication Number 20-10-008b, Ecology, 2022.

Water Quality Program, Washington State Department of Ecology. “South Fork Palouse River Fecal Coliform Bacteria Total Maximum Daily Load Water Quality Improvement Report.” Publication Number 09-10-060, Ecology, 2009.

Water Quality Program, Washington State Department of Ecology. “Stormwater Management Manual for Eastern Washington.” Publication Number 18-10-044, Ecology, 2019.

Water Quality Standards for Surface Waters of the State of Washington. “Chapter 173-201A WAC”: Apps.leg.wa.gov, apps.leg.wa.gov/WAC/default.aspx?cite=173-201A.