NRCS National Water Quality Initiative (NWQI)
Watershed Assessment:

Lower Mill Creek Watershed

Prepared By:
Walla Walla County Conservation District
in collaboration with Whatcom Conservation District
Walla Walla, WA

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WALLA WALLA COUNTY CONSERVATION DISTRICT
ESTABLISHED 1941

NRCS
Natural Resources Conservation Service

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OVERVIEW

The following document contains a watershed assessment completed for the Lower Mill Creek Watershed (HUC 1707010202) located in Walla Walla County, Washington and nested within the larger Walla Walla River Watershed Basin (HUC 17070102). This watershed assessment was conducted as part of the Natural Resource Conservation Service (NRCS) National Water Quality Initiative (NWQI) and is an exercise in characterizing and identifying the land characteristics and uses, or "critical source areas", that have the greatest potential for nutrient (nitrogen and phosphorous), sediment, and/or pathogen impacts to surface water quality. This assessment process also includes an outreach strategy that identifies barriers, opportunities, and conservation management practices that can be implemented to reduce those identified impacts.

The watershed assessment and outreach components follow the NRCS 9 Steps of Planning:

1. Identifying the pollutants of concern in the watershed.
2. Determining the water quality objectives of the watershed.
3. Inventory resources by collecting watershed data.
4. Analyze the data via modeling to identify critical source areas.
5. Formulate alternatives by suggesting various conservation practices.
6. Evaluate/model the impact of different conservation practices on water quality pollutants.
7. Work with partners on plans of action for the watershed.
8. Implement the Outreach and Implementation Plan in the watershed.
9. Evaluate the effectiveness of the plan and adapt as necessary to achieve water quality goals.

This assessment addresses steps 1-5 of the planning process outlined above. It is suggested that steps 6-8 should be evaluated next and carried out via the Outreach and Implementation Plan, with step 9 being a long-term objective of the project to be conducted by local partners indelibly.

For more detail on the general process for development of a watershed assessment plan, see the NRCS National Planning Procedures Handbook (NPPH), Subpart F: Areawide Conservation Planning (NPPH Part 600.50 B. (2)).

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BACKGROUND AND PURPOSE

Background

This watershed assessment plan was developed in collaboration with Walla Walla County Conservation District and Washington NRCS to identify critical source areas for strategic implementation of land conservation practices for surface water quality. Past and current conservation practice and plan implementation has been based on landowner engagement, opportunity, and/or regulatory response. A critical, watershed level evaluation has not been performed to create a targeted and strategic outreach effort to focus on high-risk land uses for water quality. This watershed assessment provided a means to identify critical terrain features as well as all land uses on a HUC-12 watershed level, potential pollution from nitrogen, phosphorous, sediment, and pathogens to surface waters, and the relative effectiveness of different conservation practices to effect water quality improvement. The results of the watershed assessment will be used to implement a focused and engaged watershed outreach plan to connect land users to available programs, practices, and materials, and/or guide the adoption or revision of current programs to better reach end users.

The lower Mill Creek Watershed in Walla Walla County, Washington (Figure 1) is home to a strong agricultural economy, residential communities, rural landowners, commercial business, natural habitats, and valuable natural resources. However, with so many diverse and demanding land uses, the watershed has also seen an impact to environmental resources such as water quality.

The primary artery through this diverse landscape is Mill Creek. From its headwaters in the Blue Mountains, Mill Creek flows downstream as a sinuous single channel through steep mountain canyons for about 17 miles until it enters a semi-confined valley surrounded by rolling hills, or terraces, that are characteristic of the basalt Blue Mountains with glacial Lake Missoula flood deposits topped with loess. At approximately RM 12, Mill Creek enters the broad, gently sloped Walla Walla River valley where the river's flow spreads out and slows down, thus reducing the stream's capacity to transport coarse sediment. Over time, sediment has accumulated and mounded, forcing Mill Creek to find new channels and eventually form a broad alluvial fan.

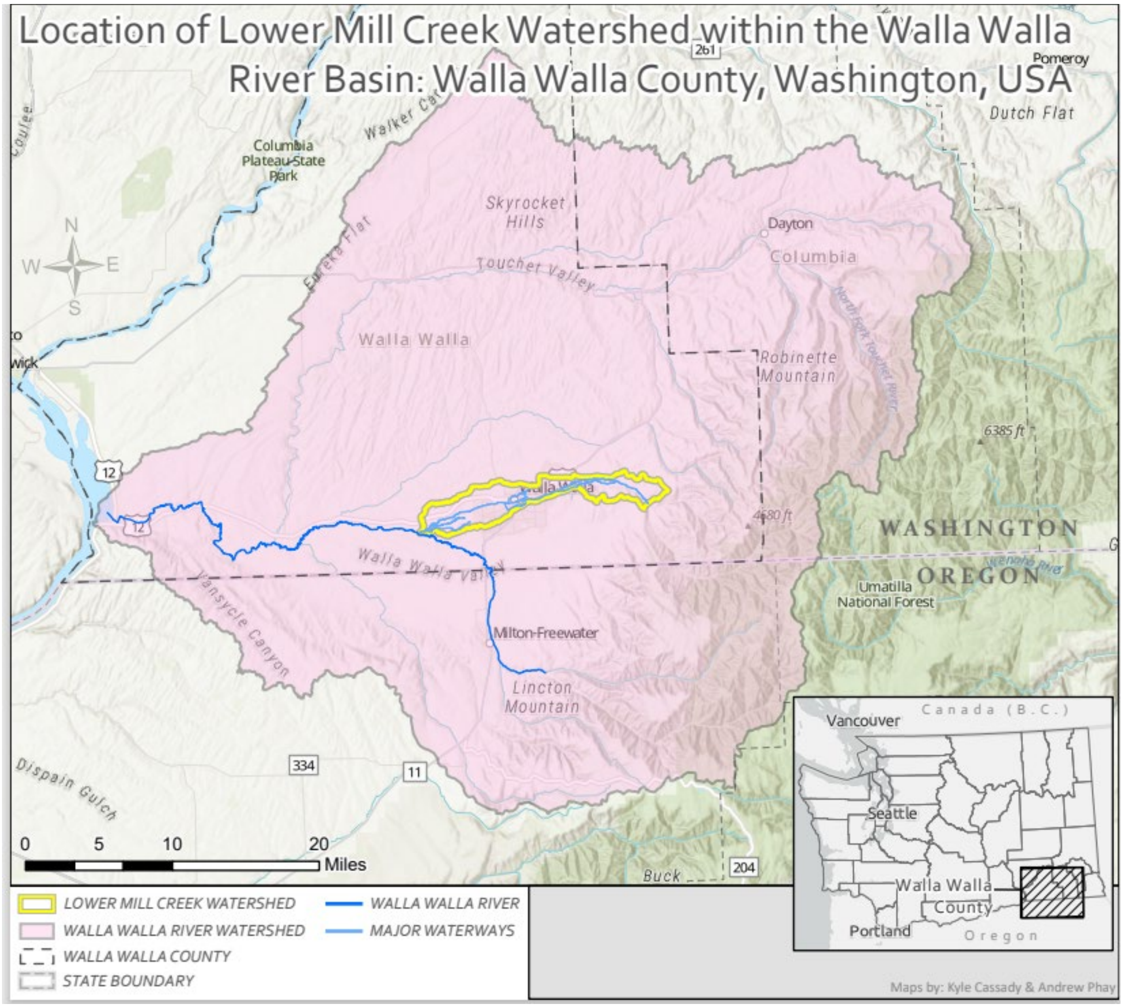

Figure 1. Location of the lower Mill Creek Watershed within the larger Walla Walla River basin; Walla Walla County, WA, USA.

Location of the Watershed Assessment Area

The Mill Creek watershed (HUC 1707010202) covers 113.7 square miles in southeastern Washington and northeastern Oregon. Mill Creek travels a length of 37.4 miles from its headwaters in the western slopes of the Blue Mountains in the Umatilla National Forest to its confluence with the Walla Walla River. The watershed elevation ranges from 6,250 feet mean sea level (MSL) at the headwaters to 590 feet MSL at the mouth.

The extent of the Project Area includes the lower Mill Creek corridor from RM 0 to near RM 17 at Blue Creek Bridge, and includes the historical and current distributary system running around and through the urbanized area of Walla Walla, Washington. The area along Mill Creek from its confluence with the Walla Walla River (RM 0) to its headwaters and including the historical and current distributary system (e.g., Titus, Yellowhawk, Garrison, and Stone Creeks).

Water Quality Resource Concerns

Based on local resource concerns, the following pollutants were chosen for evaluation in this assessment: sediment, nutrients (nitrogen and phosphorous), and pathogens. Land use would indicate that all four pollutants are potential threats to water quality within the watershed.

Sources of pollution to Mill Creek include residential, agricultural, stormwater, and wastewater. Low flows in the summer months resulting from diversions for municipal and agricultural uses can increase the concentration of pollutants as well as exacerbate high already high temperatures from lack of riparian vegetation and shading (Ecology 2002a).

Opportunities and Goals for Water Quality

The Lower Mill Creek Watershed is reflective of the greater Walla Walla County in its diverse land uses with agriculture being the primary land use (53% by acreage of crop land and farmsteads), followed by developed areas (38% by acreage of commercial, industrial, and residential), and about 9% of the watershed in natural spaces (forest, wetlands, riparian/vegetated streambank, water). The agricultural sector is serviced by a variety of agencies and organizations including the Walla Walla Conservation District (WWCCD) and NRCS who provide non-regulatory technical assistance in conservation planning and conservation practice implementation. WSU Extension, Future Farmers of America network, Blue Mountain Land Trust, WWCCD, and the Dept. of Ecology are the primary entities that interact with landowners around water quality issues for education, outreach, awareness, services, and more.

NRCS's Partnership in Reaching Goals

Local NRCS is committed to helping the watershed meet its water quality goals. NRCS actively works with Walla Walla County Conservation District through planning and implementation and has provided assistance to farmers in the watershed via programs such as EQIP. This work follows the NRCS 9 Steps of Planning and other guidelines outlined in the NRCS National Planning Procedures Handbook (NPPH) (NRCS, 2013).

WATERSHED CHARACTERIZATION

Watershed Location

As stated above in Section 1.2, Figure 1 the location of Lower Mill Creek watershed is one of three HUC 12 watersheds for Mill Creek. The Mill Creek and Walla Walla River drainages form two overlapping alluvial fans that are included within the Walla Walla River Watershed (HUC 10).

Local Climate Overview

The lower Mill Creek watershed lies within the eastern portion of the Walla Walla subbasin, within the west flanks of the foothills of the Blue Mountains. The Mill Creek watershed is located in an area where the precipitation increases. This results in an arid steppe habitat, especially within the lower subbasin (NPCC 2005). Within the subbasin, the Mill Creek watershed ranges in elevation from just under 600 feet at the confluence of Mill Creek with the Walla Walla River to 6,250 feet at Table Rock, the highest point in the watershed.

According to the Confederated Tribes of the Umatilla Indian Reservation "Lower Mill Creek Final Habitat and Passage Assessment and Strategic Action Plan," (2017), the Mill Creek watershed generally has a temperate climate; however, conditions vary considerably between the warmer, drier conditions in the west and cooler, wetter conditions in the Blue Mountains to the east. The area is characterized by cooler winters and warmer summers.

Figure 2: Average Monthly Air Temperatures at Whitman Mission, Station 459200 near the Mouth of Mill Creek (1962 – 2012).

Within the Project Area, the majority of the precipitation falls as rain, with very little occurring during the summer. According to the Confederated Tribes of the Umatilla Indian Reservation "Lower Mill Creek Final Habitat and Passage Assessment and Strategic Action Plan," an average annual precipitation ranges from around 14 inches near Whitman Mission (WWRC 2016a) to 20 inches near Walla Walla Regional Airport and Bennington Diversion Dam (WWRC 2016b, 2016c). Precipitation is considerably higher in the headwaters, with an average of approximately 40 inches of precipitation annually near the Oregon-Washington border (WWRC 2016d).

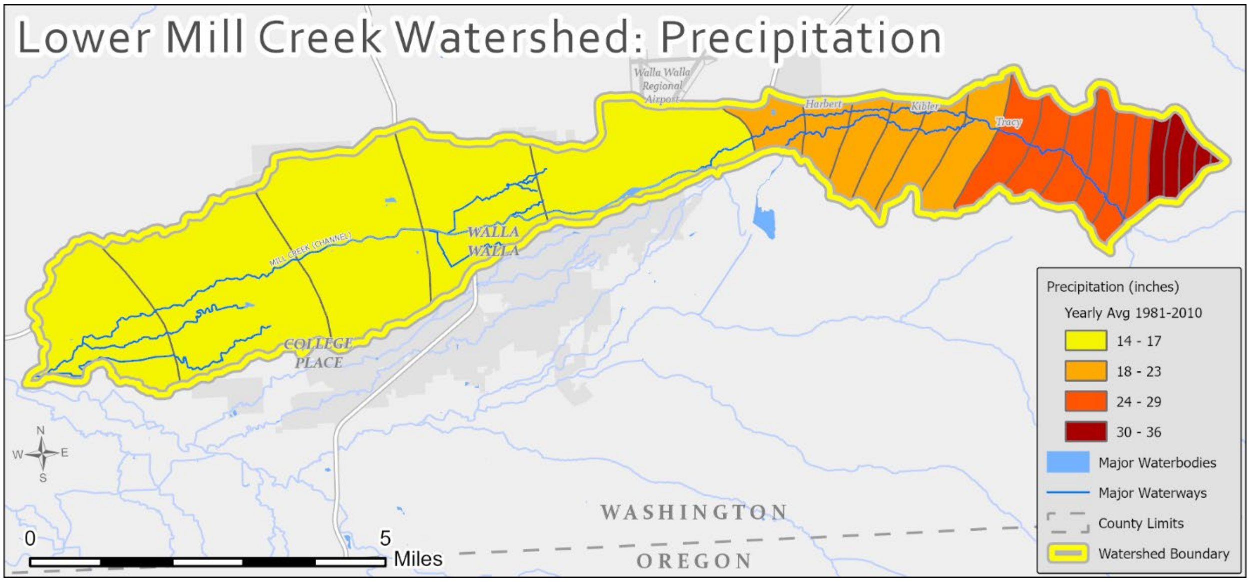

Figure 3: Precipitation in lower Mill Creek Watershed. Data source: USDA and Texas A&M University.

Physical Characterization of Watershed Area

Hydrologic Features

Figure 4 shows the hydrologic features, including waterways and watershed boundary, of the Lower Mill Creek Watershed. These waterways include the mainstem of Mill Creek and a number of adjacent waterways flow to the edge to the alluvial fan are; Cottonwood, Russell Creek, Yellowhawk, and Walla Walla River. Additional information on the hydrology of the Lower Mill Creek Watershed is found in Section 3.

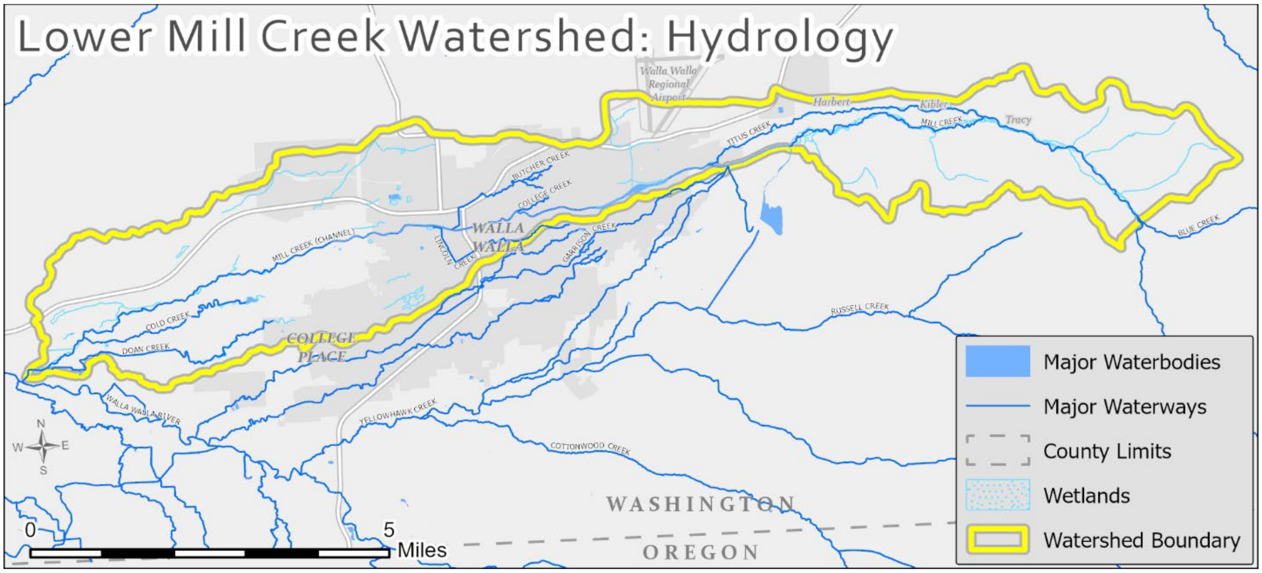

Figure 4. Hydrologic features of Lower Mill Creek Watershed.

FEMA Flood Zones

The Federal Emergency Management Agency (FEMA) provides flood hazard and risk data and defines the boundaries of regulatory floodways. The Regulatory Floodway exists outside of the Lower Mill Creek Watershed. The Special Flood Hazard Area for Mill Creek exists in the far east and western portions of the area of interest (Figure 6) which equates to a traditional 100-year flood risk zone.

More information about these flooding designations can be found online at: https://msc.fema.gov/portal/home

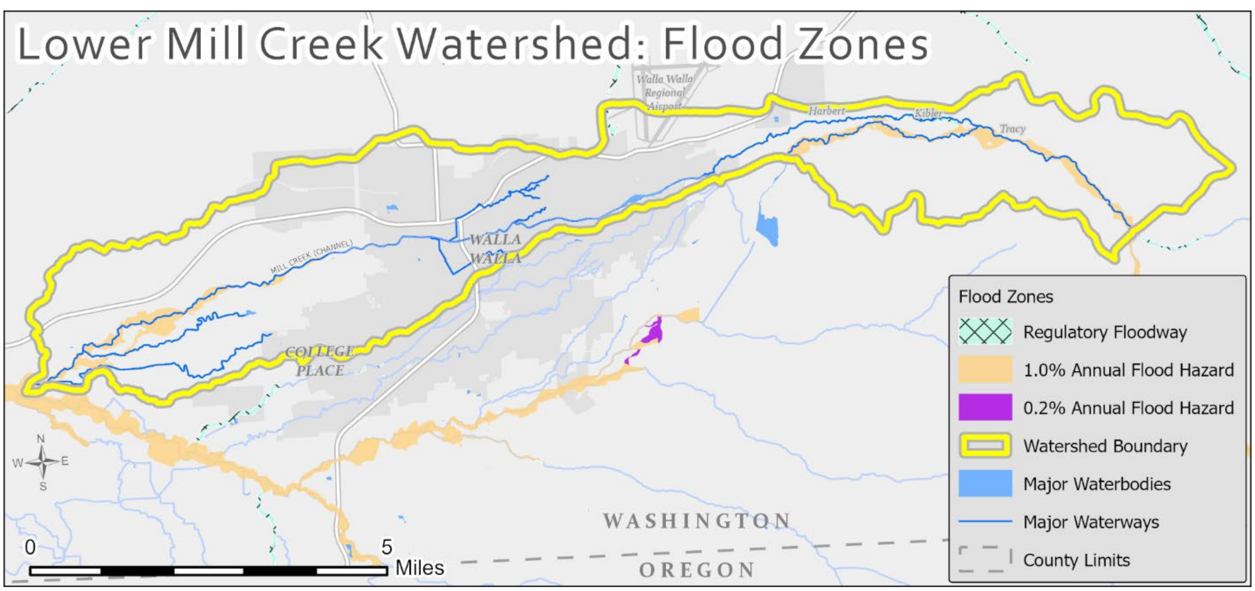

Figure 5: FEMA Flooding potential map for Lower Mill Creek Watershed (Data source: FEMA).

Soils

For NRCS purposes, soils are most often defined by their hydrologic soil group (Figure 6). Lower Mill Creek Watershed is comprised primarily of Group B soils (70%), with Group A (13%) and C soils (13%) also existing throughout the watershed.

For the purposes of the spatial modeling, soils were defined by their drainage class (Figure 7).

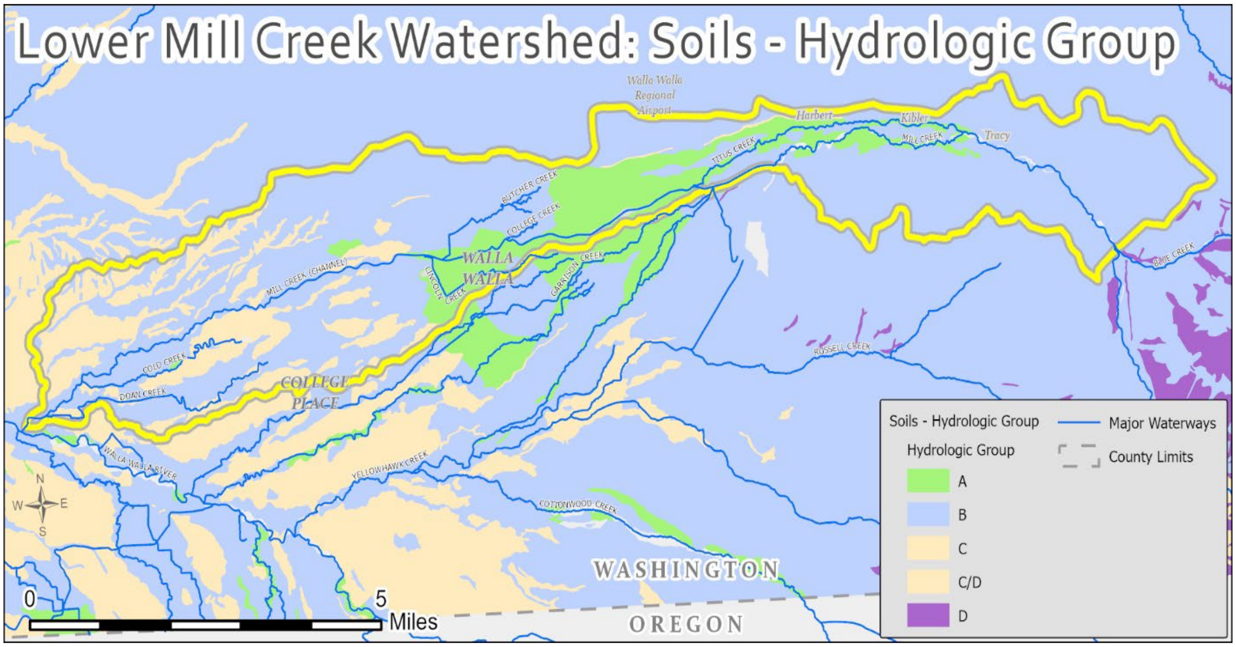

Figure 6. Soils of Lower Mill Creek Watershed by hydrologic soil group (Data source: NRCS).

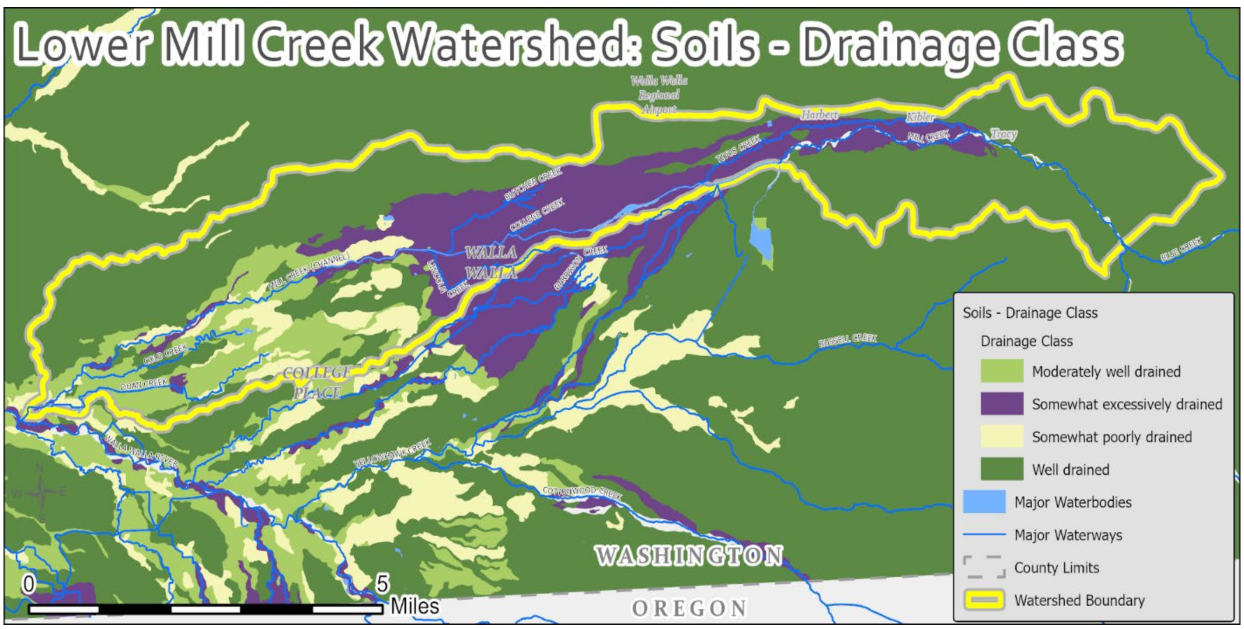

Figure 7. Soils of Lower Mill Creek Watershed by soil drainage class (Data source: NRCS).

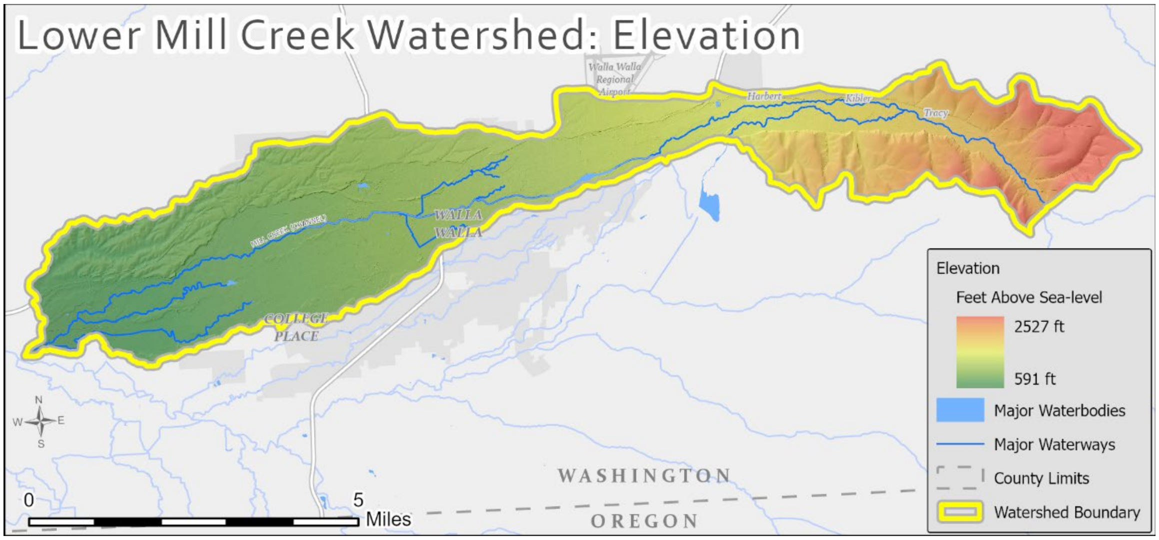

Figure 8. Digital elevation model of Lower Mill Creek Watershed derived from LiDAR imagery (WA DNR).

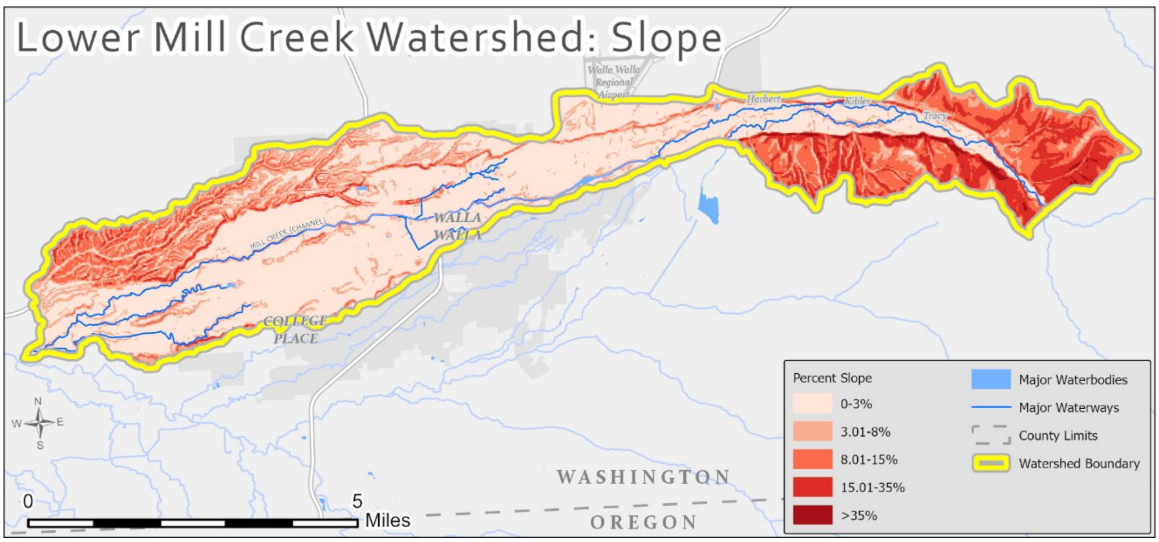

Figure 9. Slopes derived from LiDAR imagery for Lower Mill Creek Watershed (LiDAR source: WA DNR).

Digital Elevation Model

The digital elevation model (DEM) shows the elevation profile of the Lower Mill Creek Watershed. Elevation goes from 2527 ft on the eastern edge to 591ft on the western edge of the watershed (Figure 8). The DEM was derived from the Washington LiDAR Portal hosted by the WA Department of Natural Resources (WA DNR): https://lidarportal.dnr.wa.gov/.

Slopes were derived from this DEM in a 100ft-by-100ft grid. DEM values for the 100x100 foot grid square were averaged to obtain a percent slope for each grid square (Figure 9).

Land Cover and Use

Land Use Characterization

Land use in the Lower Mill Creek Watershed is predominantly crop land (53% by acreage). Crop land in the watershed includes cereal grains, garbanzo bean, hay and silage grass, pasture, vineyards, and a small number of market crops, orchards, and vegetable crops (Figure 10).

National-scale land cover datasets such as NOAA's Coastal Change Analysis Program (C-CAP) Land Cover Atlas and the USGS National Land Cover Database (NLCD) are available for the Lower Mill Creek Watershed and provide a general overview of land use in the watershed. However, these national scale land cover data sets lack the specificity and resolution that we required for the watershed assessment modeling and associated outreach. Thus, recent land use characterizations from Washington State Department of Agriculture (WSDA) (2019) were combined to create a single land cover/land use dataset for the watershed. The work to combine these datasets in ArcMap10 and ground-truth any gaps or discrepancies was done by WWCCD in 2021.

Table 3 summarizes the results of this survey in the Lower Mill Creek Watershed by four broad land use categories (agricultural crop, farmstead, developed, natural space) (Primary category) and more specific subcategories (Secondary category). Figures 10 through 12 show results of this land use survey.

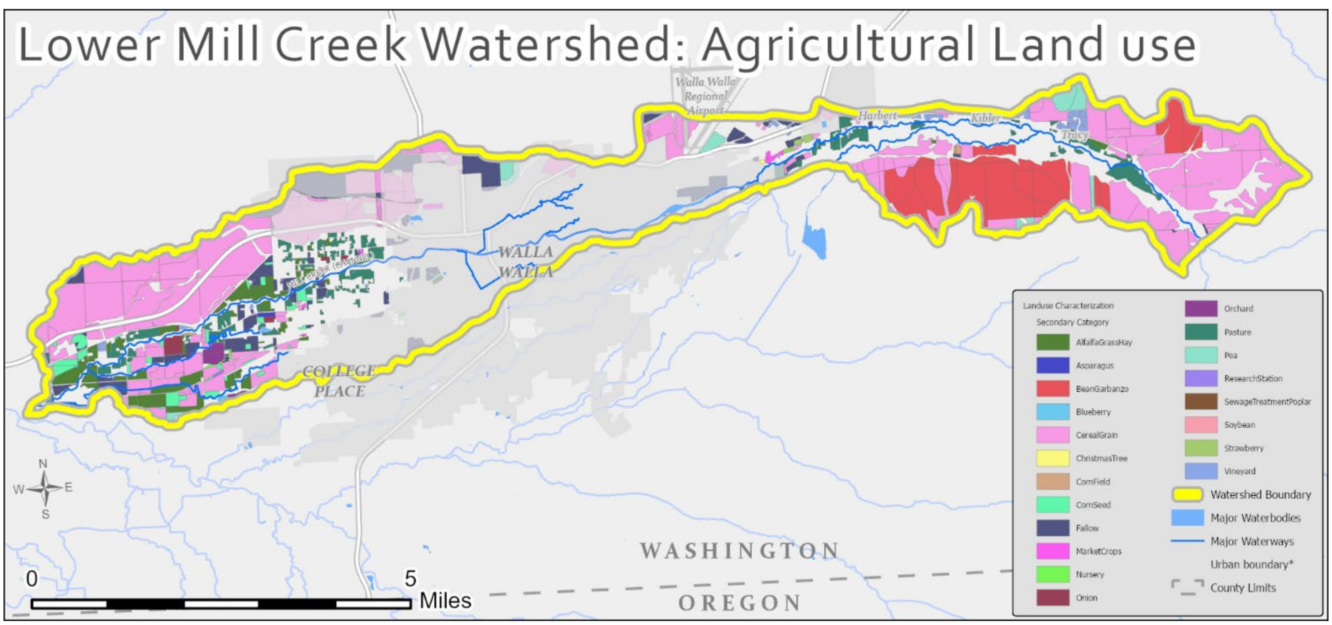

Figure 10. Agricultural crop land uses of Lower Mill Creek Watershed by crop type.

Primary Land Use Category	Secondary Land Use Category	Lower Mill Creek HUC-12 Area (Acres)	Percent of Total Watershed Area
Crop	CerealGrain	5344	29.41%
	BeanGarbanzo	1376	7.57%
	Fallow	1027	5.65%
	Pasture	627	3.45%
	AlfalfaGrassHay	476	2.62%
	Pea	264	1.45%
	CornSeed	180	0.99%
	Vineyard	98	0.54%
	Orchard	62	0.34%
	Onion	57	0.32%
	MarketCrops	32	0.17%
	Strawberry	18	0.10%
	CornField	9.4	0.05%
	Asparagus	8.6	0.05%
	Nursery	7.5	0.04%
	Blueberry	5.3	0.03%
	ResearchStation	3.7	0.02%
	Soybean	2.8	0.02%
	Poplar	2.1	0.01%
	ChristmasTree	2.0	0.01%
	Total	***9602***	***52.84%***
Developed	Commercial	3891	21.41%
	Residential	1370	7.54%
	RoadsShoulder	758	4.17%
	CropFarmstead	337	1.85%
	OtherAnimalFarmstead	229	1.26%
	CommercialTurfGrass	206	1.14%
	Unmanaged	68	0.37%
	Railroad	46	0.25%
	Total	***6904***	***37.99%***
Natural	Riparian	805	4.43%
	Unmanaged	651	3.58%
	Forest	169	0.93%
	Water	40	0.22%
	Total	***1666***	***9.17%***

Table 1. Land use in the Lower Mill Creek Watershed. Land uses are categorized into four primary categories (agricultural crops, farmsteads, developed, and natural). Each primary category is subdivided into secondary categories that further describe the land use. All land uses sum to a total watershed area of 18,172 acres.

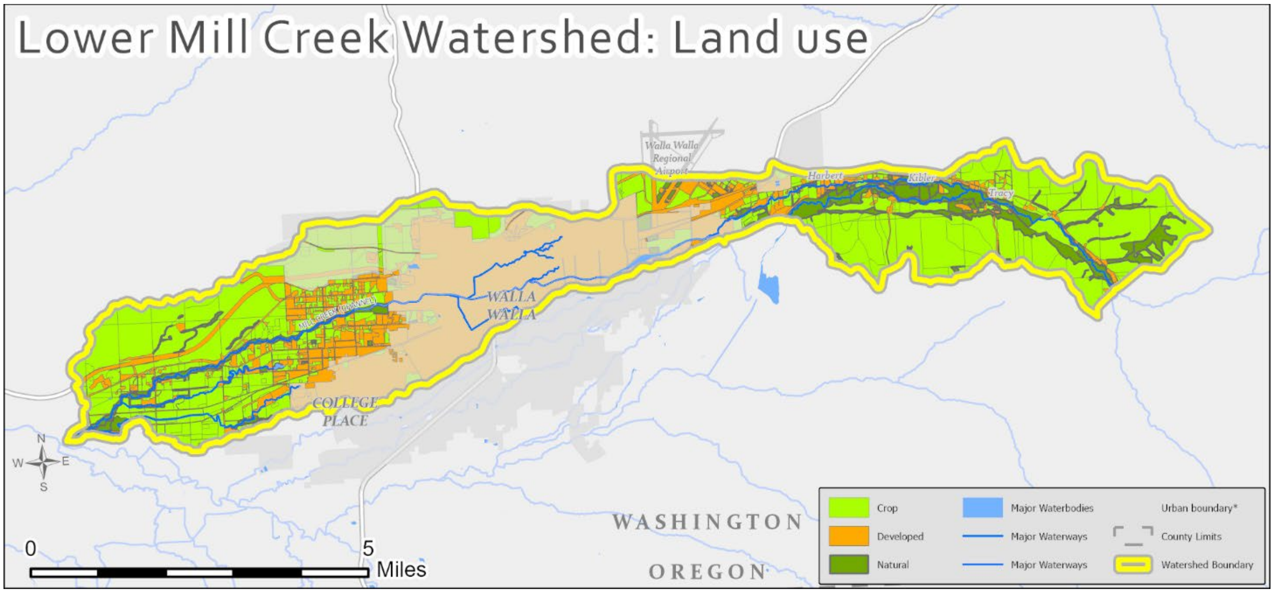

Figure 11. Land uses of the Lower Mill Creek Watershed. Areas are classified as crop, developed, and natural.

Livestock Surveys

In addition to the land use characterization work, parcels with livestock in the Lower Mill Creek Watershed (Figure 12) were identified using *windshield* surveys of the watershed by WWCCD staff. This livestock information was used in the spatial modeling and will be useful for designing and implementing livestock-specific outreach.

The *windshield* surveys represent observations of livestock on the landscape at the time of the survey. They are not comprehensive nor all inclusive. While attention was given to complete coverage of the watershed, there are some limitations to this data. The season, day, or even time of day that these surveys were conducted can affect whether livestock can be observed. Secondly, all windshield surveys are conducted from the public right of way which limits the observations that can be made in certain areas. Private roads or driveways were *not* used to make observations or properties that are difficult to see from the main roadways.

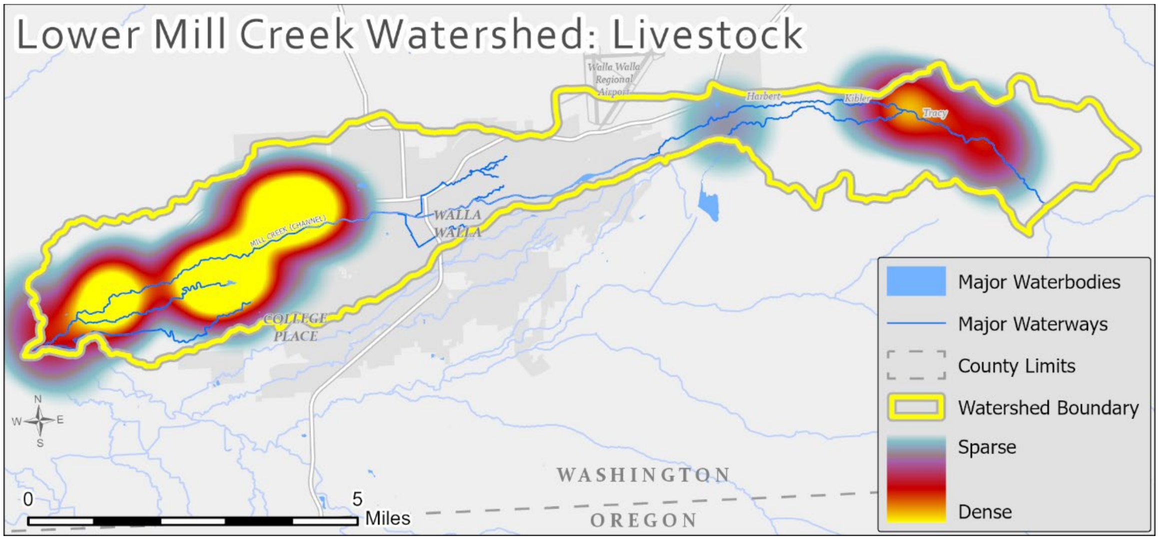

Figure 12. Livestock concentration in the Mill Creek Watershed by animal type from windshield survey conducted by the WWCCD staff in October 2021.

Socioeconomic and Demographic Characterization of Watershed

The Lower Mill Creek Watershed consists of large acreage agriculture, small acreage hobby farms, high density urban areas, commercial business districts, and rural residential. The watershed is predominately zoned Agriculture and Incorporated City Limits (both City of Walla Walla and City of College Place) with its associated Urban Growth Areas (https://walla-walla.maps.arcgis.com/home/index.html).

The population of Walla Walla County is 62,584 as of the 2020 according to the US Census Bureau. Figure 13 presents the percentage of local employment by industry in the Primary Focus Area and Washington State. With multiple colleges and hospitals, the educational services and health care/social assistance sector is the largest source of employment in the AOI at approximately 32 percent, exceeding the state total by 10 percentage points. Agriculture is also more prominent in the AOI than the state as a whole, particularly in the more rural areas surrounding the City of Walla Walla. Indeed, agriculture is a major economic resource for Walla Walla County with the market value of production totaling over $437 million dollars in 2012 (USDA 2012) and more than 100 wineries providing local employment and drawing visitors to the region (Visit Walla Walla 2016).

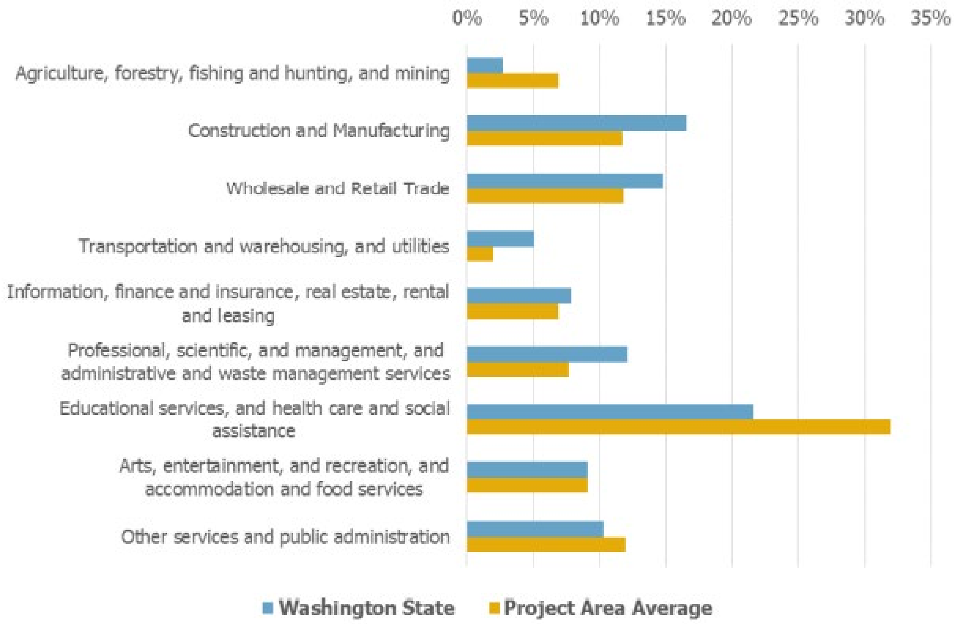

Figure 13. Percentage Employment by Industry, ACS 5-Year Estimate (2010–2014)

HYDROLOGIC AND WATER QUALITY CHARACTERIZATION

3.1 Available Water Quality Data and Resources

Water quality monitoring in the Walla Walla subbasin has been conducted by a number of groups over the years including the United States Army Corps. Of Engineers (USACE), Confederated Tribes of Umatilla Indian Reservation (CTUIR), Environmental Protection Agency (EPA), Oregon Department of Environmental Quality (ODEQ), and Washington State Dept. of Ecology (Ecology). Ecology maintains a comprehensive database of environmental monitoring data in Washington, referred to as the Environmental Information Management (EIM) database. The EIM contains water quality monitoring data and analyses prepared by Ecology and also submitted by affiliated monitoring agencies (Ecology 2015c). However, the database indicates data gaps and inconsistent routine monitoring. A general concern for the Lower Mill Creek Watershed is that a routine and consistent water quality monitoring is lacking. Creating a more expansive water quality monitoring program may benefit the watershed as a whole.

303(d) Assessed Waters

Portions of Mill Creek are listed on Washington State's Water Quality Assessment and 303(d) list of impaired waterbodies for the following pollutants: ammonia-nitrogen (ammonia-n), chlorine, dissolved oxygen, pH, fecal coliform, and temperature (Ecology 2012a). These pollutants can affect the health of fish and quality of fish habitat.

3.2 Watershed Hydrology

Based on The Lower Mill Creek Habitat and Passage Assessment and Strategic Action Plan of 2017, channel characteristics of Mill Creek are controlled by fluvial processes (e.g., streamflow, sediment transport, channel migration) acting on a specific set of boundary conditions including bed and bank materials, the presence of in-stream large woody debris (LWD), and geologic or anthropogenic constraints (e.g., bed control weirs, concrete flume channel, dams, diversion, flow storage, and levees). A long history of land use activities and infrastructure development has altered the geomorphology of Mill Creek in the Area of Interest (AOI) relative to historic conditions.

Flows at the bankfull tend to be the primary channel-forming flows and tend to deposit sediment as bars and other features that define the channel form. Alteration of the flow regime has reduced channel conditions that provided quality aquatic habitat.

3.3 Irrigation in the Lower Mill Creek Watershed

The Walla Walla County Conservation District has been working with area irrigation districts for over 20 years. A concentrated effort on irrigation efficiency practices began in the late 1990's coinciding with the USFSW lawsuit against three large irrigation districts for creating adverse condition for ESA listed species through diverting surface flows from streams for irrigation use. In particular, FWS required bypass flows sufficient to allow the operation of the fish ladders on each dam, which amount to a bypass flow of ten cfs at the GFID diversion (Filippi, 2000) requires a certain amount of surface flow to remain in stream. Irrigation use may be regulated according to the in-stream flow rule. According to the USDA National Agricultural Statistics Survey (census 2017) irrigated land amounts to 101,678 acres in the entire Walla Walla County. Precise statistics for the low Mill Creek watershed are not known. Irrigation use as observed in the lower Mill Creek watershed tends to be localized in the western, lower portion of the watershed for crops or for pasture and off-stream livestock watering facilities. On farm irrigation efficiency upgrades are feasible for these areas.

There are a small number of irrigation districts with service areas in the lower Mill Creek watershed. The WWCCD conducted an analysis of one of these irrigation districts in 2017. Most of these service areas have farms that have been subdivided into small acre residential lots. The irrigation lines have assumed map locations and are prone to have significant roots and other maintenance concerns.

This NWQI assessment does not evaluate irrigation uses in the lower Mill Creek Watershed and does not account for irrigation in the spatial modeling. While irrigation data on a field use scale is not available for this watershed, a general overview of irrigation practices was conducted to assess potential high impact land uses for mitigation. In general, irrigation is conducted for the majority of crops grown. Most irrigation water is from either shallow groundwater wells or surface diversions from streams. Both the shallow gravel aquifer and streams are hydrologically connected and should be considered one unit for the sake of conservation practice implementation. More work is needed to properly inventory the number of acres irrigated. Challenges include crop rotation and seasonal variability which impact the need to irrigate, which will affect the timing, volume, and number of acres irrigated annually.

RESOURCE ANALYSIS ASSESSMENT

4.1 Overview of Watershed Assessment Model

Objective

The potential for pollutants to leave land surfaces and enter nearby surface waters depends on:

1. Terrain features (e.g. soil type, topography, proximity to surface waters)
2. Land use
3. Specific land management activities or practices

The objective of the watershed assessment model was to incorporate spatial data in order to estimate each of the parameters listed and overlay them spatially in order to identify specific critical source areas (CSA) within the watershed. A CSA is an area where pollutant "export" to surface waters is likely the result of a combination of terrain features and land use. The level of risk associated with a CSA can be modified with the addition of a known or modeled land management activity or practice to show where pollutant export can be reduced or eliminated. In many cases, these activities are already being employed by land managers to protect water quality and public health.

It is important to note that these CSA are potential, meaning that they do not necessarily represent the actual conditions of a site. Well considered land use management (e.g. consideration of soil type, topography, and proximity to surface waters) and the implementation of conservation best management practices or "BMPs" can reduce or eliminate the potential for runoff into surface waters, thereby reducing that critical source area risk level.

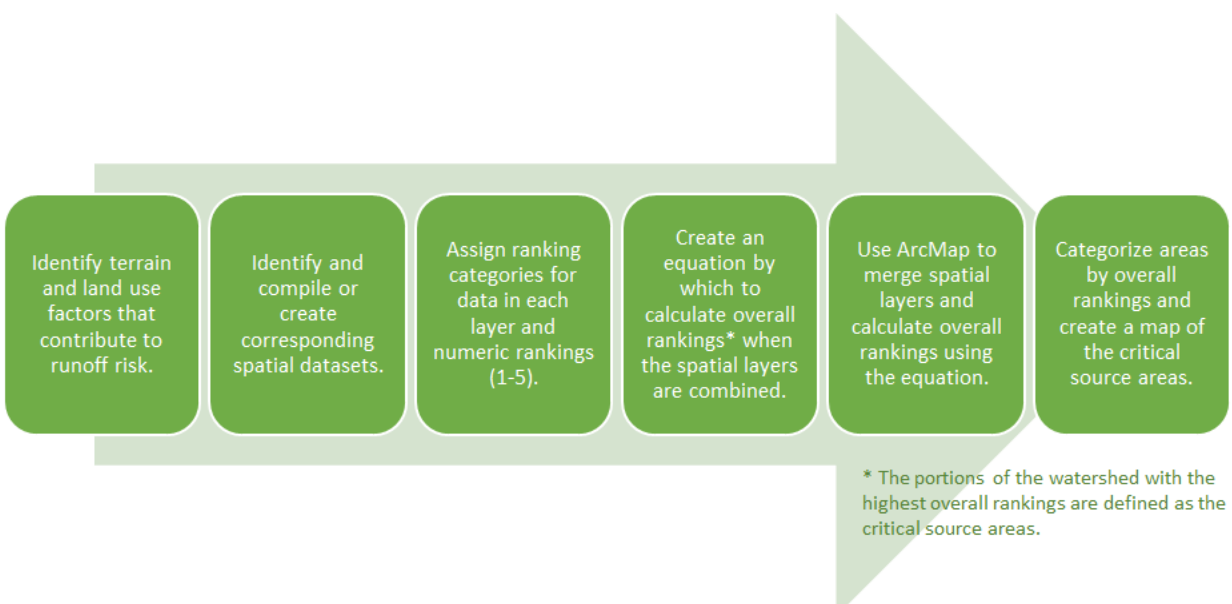

Figure 14. Workflow graphic for spatial modeling approach using ArcMap10.

Spatial Modeling Approach

The workflow process for the spatial modeling approach employed is illustrated in Figure 19. The first step in modeling the critical source areas was to identify factors of terrain and land use that contribute to runoff risk and the potential to export pollutants. These factors were identified, and the necessary spatial data layers were compiled or created to map each factor (e.g. precipitation, soils, and land use data sets). An initial list of more than 20 layers was simplified into a list of eight of the most influential layers (five terrain and three land use layers) used for the final modeling (Table 3). The spatial data layers (or shapefile) included in the model are further described in Appendix A. Additional information about these layers can be found in Section 2 (Watershed Characterization).

In order to combine these layers and compare areas with lower or higher pollutant export potentials, the data in each layer was ordered into 2-5 categories or bins, each of which was given a ranking score of 1-5 (Appendix A). For the land use categories, each land use was assigned five different ranking scores, one for each of the pollutants (phosphorus, nitrogen, sediment, and pathogens) and a combined pollutant ranking score (Appendix B). The combined score represents the combined pollutant export potential for all four pollutants when considered together. The categories and ranking scores were defined by WWCCD/WCD staff using relevant literature and expert knowledge.

The spatial layers (and their associated ranking scores) were combined in ArcMap10 using the Merge tool and Calculate field tool to create unique polygons each with a different overall ranking score. For each polygon, the ranking scores for the contributing input layers was summed to create a relative overall ranking score. A higher relative overall ranking score represents an area with a higher potential of pollutant export, hereafter referred to as a critical source area (CSA). Section 4.1 describes the different CSAs that were created based on the input layers.

The overall ranking scores were categorized as low, medium, medium-high or high pollutant export potential. The areas with a ranking of medium-high or high are the ones defined as a CSA. Maps were created to illustrate the locations of the CSAs within the watershed and help draw conclusions about the most influential terrain and land use factors contributing to CSAs within the Lower Mill Creek Watershed (Section 4.1, Figures 20 through 25).

Table 2. Spatial data layer model inputs were grouped into two categories: terrain factors and land use factors.

Terrain Factors	Land Use Factors
Annual average precipitation	Land use classification
Proximity to waterways	Livestock presence (from livestock surveys)
Location relative to flood zone	
Soil Drainage Class	
Slope (derived from DEM)	

4.2 Critical Source Areas (CSA) Identified

The modeled critical source areas (CSA) in the Lower Mill Creek Watershed are described through a series of six maps (Figure 14-19) including:

(1) Critical source areas considering terrain factors only (Figure 14).
(2) Critical source areas considering terrain factors and land use with pollutant risk combined for the four pollutants (nitrogen, phosphorus, sediment, and pathogens) (Figure 15).

(3-6) Critical source areas considering terrain factors and land use with each pollutant (nitrogen, phosphorus, sediment, and pathogens) considered individually (Figures 16 through 19).

The layers included in the CSA calculations for each map are listed in Table 3; more information on each layer can be found in Appendix A. The CSA ratings displayed on the map (Low, Medium, Medium-High, High) are based on the CSA scores described in Section 4.1 (Spatial Modeling Approach). A Critical Source Area is defined as an area with a rating of high or medium-high. It should be noted that the area within the City of Walla Walla boundaries have been modeled but are masked in Figures 15-19 because of the uncertainty about how accurate the modeling is. The modeling is generally set up for nonpoint runoff off the landscape. Urban stormwater falls into this nonpoint runoff, but when you take storm drains, sewer, residence's, etc. into account, these inputs become more point sources. The locations of these features have not been mapped. More work would be needed to validate the model within city limits. At this point it is our best estimate of runoff from developed areas of the Lower Mill creek watershed. Since urban area source contributions are not the focus of this assessment, this area was left masked and CSA ratings not provided. This area *is* included in Figure 14 where only terrain factors (and not land uses) are considered in the model.

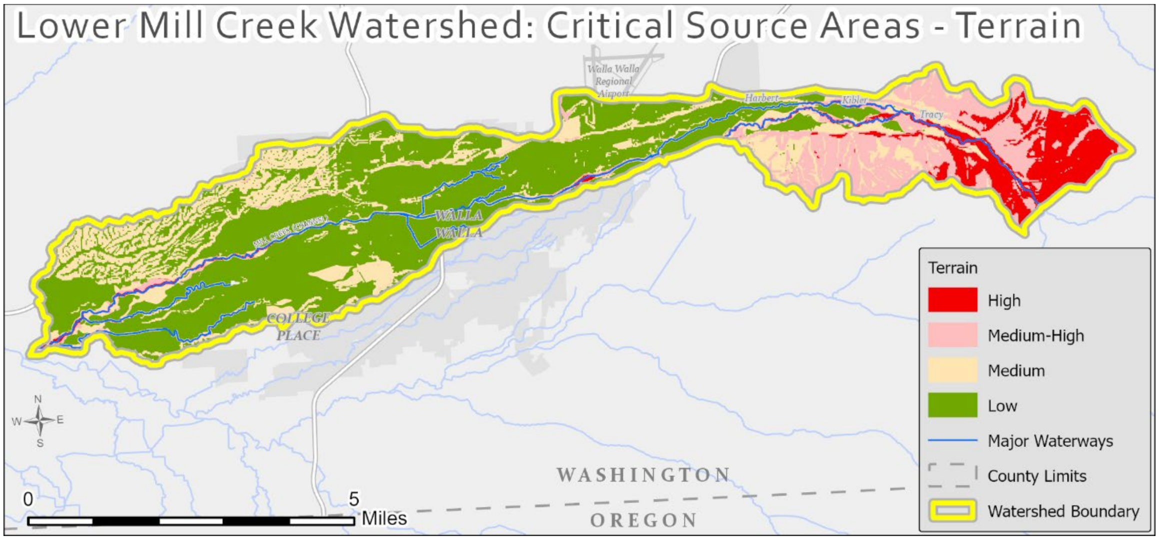

Figure 15. Potential critical source area contribution rating for terrain factors in the Lower Mill Creek Watershed.

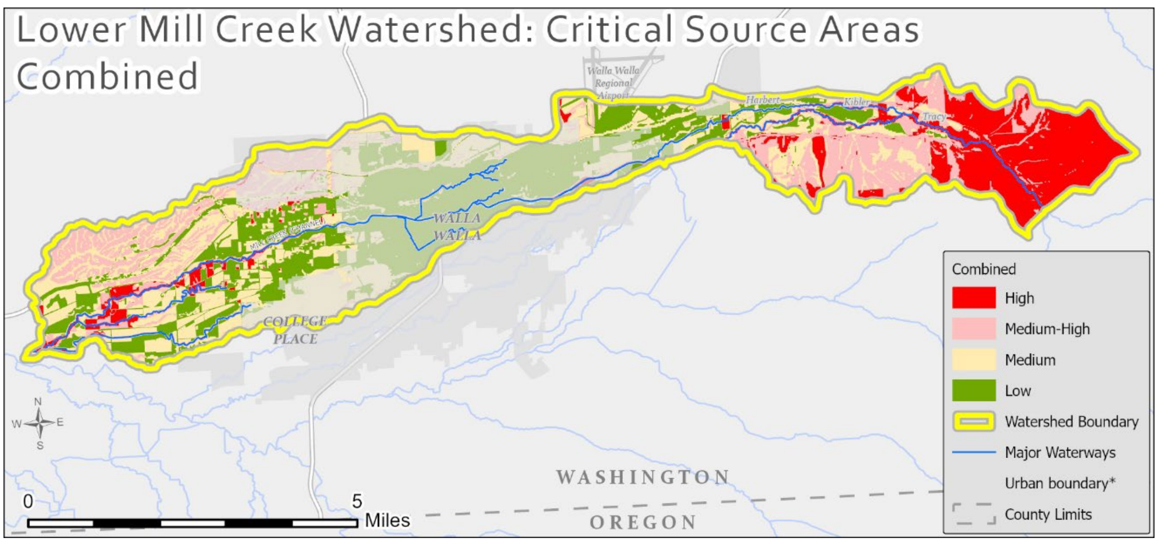

Figure 16. Potential critical source area ratings based on terrain and land use factors in the Lower Mill Creek Watershed using the combined pollutant ranking score.

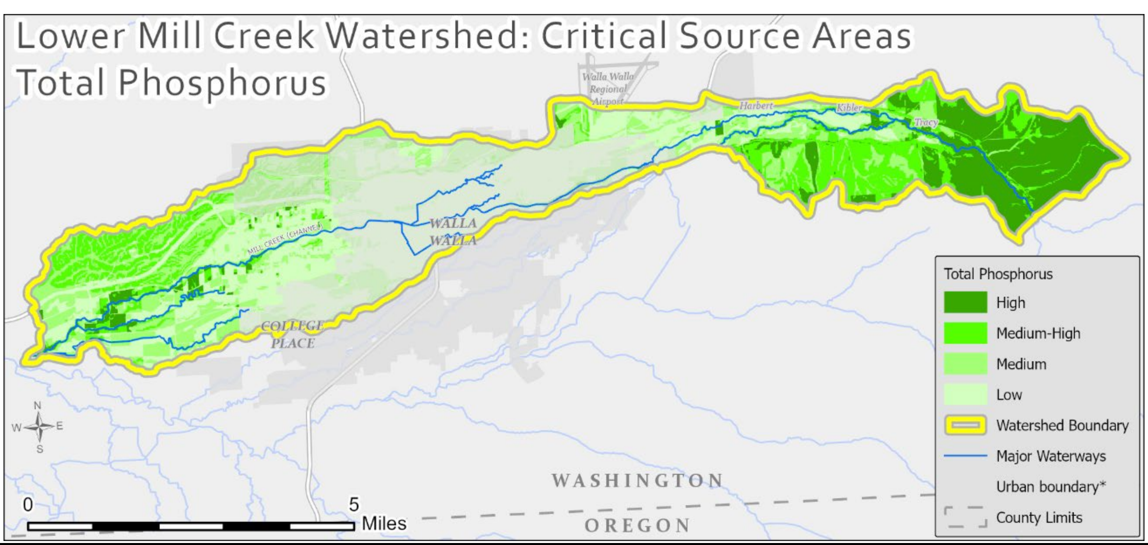

Figure 17. Potential critical source area ratings for Phosphorus based on terrain and land use factors in the Lower Mill Creek Watershed.

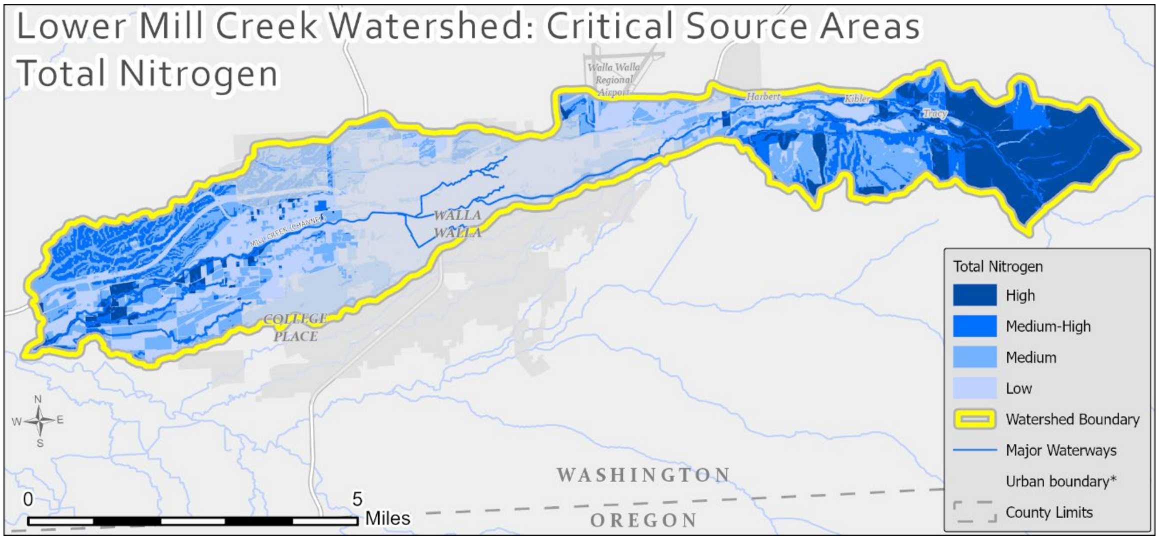

Figure 18. Potential critical source area ratings for Nitrogen based on terrain and land use factors in the Lower Mill Creek Watershed.

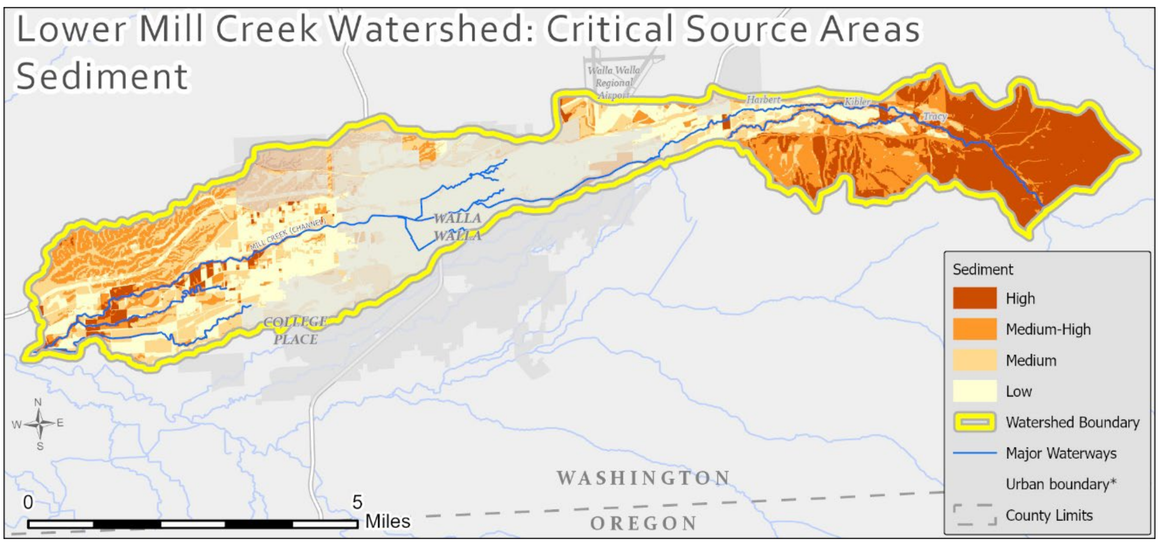

Figure 19. Potential critical source area ratings for Sediment based on terrain and land use factors in the Lower Mill Creek Watershed.

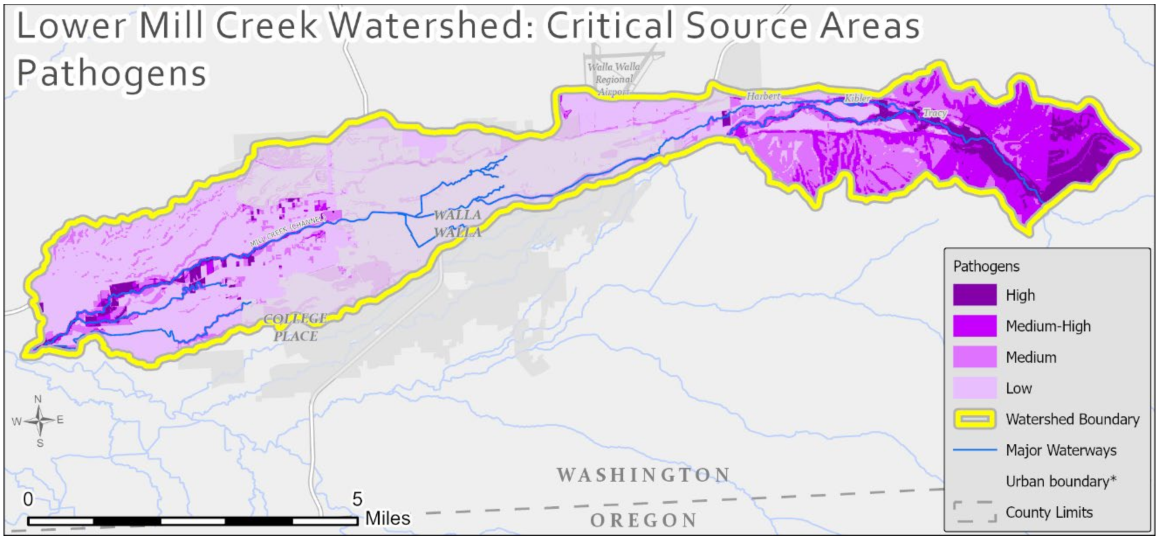

Figure 20. Potential critical source area ratings for Pathogens based on terrain and land use factors in the Lower Mill Creek Watershed.

The critical source areas identified for terrain (Figure 15), combined (Figure 16), and individual pollutants (Figure 17, 18, 19, and 20) shows the effect of both the land features and land use on each assessment. For the terrain map, areas with steep slopes and poorly drained soils had a significant impact on elevating the rating. This can be seen in the combined map which highlights the impact that certain land uses can have on increasing the rating when also overlaid on higher risk terrain. These maps showcase the use of the model to select and tailor conservation practice implementation by location and land use. Further differentiation can be made by assessing the individual pollutant maps which provide insight into the combination of terrain, land use, and pollutant potential when a targeted practice implementation approach is desired. In addition to focused practice implementation by land use, the maps also show locations where targeted outreach on practice and/or land management can be done. By overlapping land assessment maps (Figures 10-12) with the CSAs, these locations can be prioritized in programs and planning.

4.3 Treatments and Opportunities

Conservation Management Practices

NRCS provides conservation practice standards that outline the purpose, applicable conditions, and criteria for why, where, and how a conservation management practice is applied to achieve its intended purpose. Tables 3 and 4 show the top identified NRCS practices for local water quality protection for the Cropland and Farmstead categories assessed, respectively. Practices were identified by WWCCD and local NRCS staff by reviewing the land use survey and terrain features to determine which practices were relevant to local conditions and would have the largest impact on improving water quality. This list is not exhaustive nor inclusive of all supporting practices. Further ground-truthing of the effectiveness of each practice, for each pollutant, is encouraged to identify impact to modeled pollutants.

It should be noted that selection of practices for a cropland or farmstead site is typically done as a suite to achieve the desired resource protection outcome. It is less common for a singular practice to achieve the desired conservation goals. Additionally, some practices, such as Riparian Forest Buffer (NRCS Practice Standard 391), work best when implemented by several landowners in a connected fashion over a waterway, not as discrete, disconnected pockets. Therefore, practices should be selected based on current cropland and farmstead conditions, landowner goals, and desired level of resource protection.

For more effective use, the information provided in Tables 3 and 4 should be coordinated with the CSA results presented in Figures 16 through 20 to identify the top land uses and areas in the watershed to apply the practices to. In this way, the planning approach will be targeted to the most effective and promising land uses.

Assessment of Management Scenarios

In addition to identifying critical source areas based on terrain and land use features, this model can be used to inform decision making around management practice implementation. The following two examples show how this could be done in the Lower Mill Creek Watershed.

Identify potential locations for management practice installation. Terrain and land use features impact both the feasibility of practice installation and the effectiveness of the practices installed. For example, Structure for Water Control (NRCS Practice Standard 587) are an effective practice when installed to improve subsurface irrigation water management but should not be installed on well-drained soil types where the practice is not necessary. The model could be used to evaluate or prioritize locations for these water control structures within the watershed by assessing soil and terrain features along with land use to identify and prioritize impact areas.

Better understand how management practices will impact water quality across the watershed. Broad implementation of conservation management practices can minimize the risk of pollutant runoff, thereby reducing the amount of high and medium-high CSAs. By incorporating these practices into the pollutant ranking scores used within the model (see Section 4.1, Appendix B), reductions in critical source areas can be estimated at discrete locations and across the watershed.

Table 3. Most effective NRCS conservation management practice(s) identified for surface water quality protection by agricultural crop.

Conservation Management Practice	Irrigation Water Management	Structure for Water Control	Nutrient Management	Manure Application Setbacks	Prescribed Grazing	Conservation Cover / Cover Crop/Conservation Crop Rotation	Field Border	Filter Strip	Riparian Forest Buffer	Mowing / Brush Management	Underground Outlet (Ditch Cover) / Drainage Ditch Covering
NRCS Practice Standard Code	449	587	590		528	327/340/328	386	393	391	314	620/775
Crop-Blueberry	x	x	x	x		x	x	x	x		x
Crop-Caneberry	x		x	x		x	x	x	x		x
Crop-Corn	x	x	x	x		x	x	x	x		x
Crop-Forage	x	x	x	x					x		x
Crop-Pasture	x	x	x	x	x				x		x
Crop-Nursey	x		x	x		x			x		
Crop-Orchard	x		x	x		x			x		
Crop-Potatoes	x	x	x	x		x	x		x		x
Crop-Unmanaged			x	x					x	x	

Table 4. Most effective NRCS conservation management practice(s) identified for surface water quality protection by farmstead type.

Conservation Management Practice	Watering Facility	Feed Management (Seasonal Feeding)	Fence / Access Control	Field to Road Tracking	Heavy Use Area	Roof Runoff Structure & Outlet	Waste Transfer	Waste Storage Facility	Roofs and Covers	Access Road	Vegetative Treatment Area	Agrichemical Facility (Fertilizer mixing)
NRCS Practice Standard Code	614	592	382/472		561	558	634	313	367	560	635	309
Farmstead-Crop				x		x						x
Farmstead-Dairy	x		x	x		x	x	x	x	x	x	
Farmstead-Other Animal	x	x	x		x	x		x	x	x	x	

SUMMARY AND RECOMMENDATIONS

5.1 Watershed Assessment Summary

The watershed assessment was conducted on the Mill Creek Watershed to better understand the dynamics of the pollutants of concern (Nitrogen, Phosphorous, Sediment, Pathogens) including the source areas of these pollutants and the way in which management practices can be implemented in the watershed to reduce pollutant concentrations and loading.

A spatial modeling approach was used to identify potential critical source areas (CSAs) based on terrain characteristics, land use, and estimated impacts. These critical source areas can be targeted for management practice implementation through improved outreach, planning, and even NRCS cost-share prioritization. This strategy is covered further in Section 6 (Outreach), which identifies outreach strategies for communicating with landowners in the watershed.

5.2 Practice Implementation Recommendations

This assessment has identified current agricultural land uses (Table 1) and potential conservation practices (Tables 3 and 4) which are recommended for the Implementation Phase of the NRCS NWQI program. These practices are based on local land use, climate, effectiveness, and feasibility. Additional modeling work needs to be conducted to identify the most effective practices for each land use based on current practices by the landowner. This information needs to be gathered on an individual basis through landowner engagement.

Estimation of costs for recommended practices should be based on current EQIP cost-share rates.

5.3 Effectiveness Monitoring

The following subsections outline the various areas that NRCS, along with key partners, can establish and track metrics of success for determining the effectiveness of NRCS programs, planning, and practice implementation at protecting surface water quality. By developing a strategic tracking plan in conjunction with this Watershed Assessment, efforts can be directed where they are needed to achieve a greater level of resource protection and/or document those existing efforts that are already successful.

Effectiveness Monitoring of Watershed Plan

Without a tracking and monitoring plan in place, it is difficult to assess the impact and success of a watershed plan. It is recommended that in conjunction with this Watershed Assessment, the Implementation Phase of the NRCS NWQI watershed plan define and track *measurable* metrics for progress in the following three categories:

1. *Implementation:* Location of where NRCS practices are currently being implemented and to what level. This would be conducted by NRCS and partners such as WWCCD.

2. *Effectiveness:* Water quality levels at or near implementation sites that are measurable as concentration reductions or load reductions. This would be conducted by local partners and others as applicable and shared with NRCS.

3. *Broader Impact:* Improvements in *downstream* water quality to relate actions in the Mill Creek watershed to improvements in the greater Walla Walla Watershed and for anadromous fish habitat restoration objectives.

Conservation Practice Implementation

The implementation of conservation practices to the landscape is imperative to reduce any impacts of terrain and land use interactions as demonstrated in Section 4.2. To assess both the coverage by land use type and resource impact, implementation of conservation practices across the watershed should be tracked by NRCS and planning partners such as WWCCD including:

- Number of landowners/operators contacted
- Number of landowners/operators participating in programs including land use type and relevant demographic information
- Number of historically underserved producers contacted or enrolled
- Number and type of pollution sources identified
- Number of farm plans completed
- Number and location of practices planned and installed/implemented
- Number of acres treated by implemented practices
- Summary CSA rating of land that practices were installed on

This information could then be aggregated by land use type and CSA, if applicable, and compared to practices listed in (Tables 3 and 4) for applicability. The outreach plan may inspire conservation stewardship outside the tracking parameters identified above, intrinsic motivation to change behavior, or management not associated with NRCS or WWCCD programs. These results are more difficult to quantify and would require follow-up surveys post-implementation for adequate assessment.

Conservation Practice Monitoring

While average effectiveness of conservation practices can be estimated using best available science, the monitoring of conservation practices on the ground is valuable to determine their effectiveness over different terrain features, local conditions, and management strategies. Successful monitoring of conservation practices that use phytoremediation have been shown using NRCS's Stream Visual Assessment Protocol 2 (SVAP2) from the "National Biology Handbook" (NRCS, 2009) in riparian areas and other vegetation surveys to assess survivorship and efficacy. These monitoring surveys will be essential for evaluating the success of planting practices like riparian buffers. The Conservation Reserve Enhancement Program (CREP) and the Commodity Buffer Program (CBP) are locally available programs that utilize phytoremediation to enhance environmental functions while reimbursing the landowner to implement and maintain a vegetative buffer.

Implementation of Edge of Field (EoF) monitoring sites for assessing the impact of land management activities to adjacent surface waters is recommended for Walla Walla County. This system installs surface flow (and sub-surface flow, when appropriate) monitoring equipment at the edge of a field/area in a controlled experimental design (control-treatment scenario), and implements specific management practices/scenarios on the land surface and measures their potential impact/protection on water quality.

Implementing EoF monitoring in Walla Walla County is recommended in order to collect event mean concentration (EMC) data for various soils, land use types and practices. These EMC values could be used to strengthen the spatial modeling described in this assessment or to support other modeling by local and State. EoF data also gives indication of when specific soil types have surface runoff, data which can be used to strengthen the model and/or assist in tailored conservation practice implementation. These results can guide recommendation of various conservation practices for maximum protection of water quality.

For more information on the NRCS Edge of Field Monitoring program: https://www.nrcs.usda.gov/wps/portal/nrcs/detail/national/water/quality/tr/?cid=stelprdb1240285

Conservation Planning

Conservation planning, also referred to as "farm planning", is an important part of the overall success and monitoring of the watershed plan. The planning process allows interaction with individual landowners and assessment of their level of implementation of current and planned practices. It also allows a planner to conduct an assessment of their landscape, which can be used to validate the model parameters and improve the effectiveness of conservation practice implementation. The final step of the planning process requires the process of adaptive management and plan evaluation. This can be used to track progress of individual landowners in implementation of land use activities and subsequent water quality impacts, both positive and negative. It can also assist in modification of practice adoption or implementation as new science-based information is obtained about practice effectiveness. It is recommended that the activities associated with adaptive management be added to the long-term planning process as a practice to ensure they are conducted.

Water Quality Monitoring

Water quality sampling provides an on-going, real-time way to look at water quality on a scalable level (i.e., by total watershed, sub-watershed, or field level) to assess actions taken within a discrete area. Current water quality monitoring efforts are conducted locally by the Ecology, CTUIR, USGS, USACE and other local agencies. The following recommendations are those activities that support the watershed assessment and monitoring for progress:

- *Current surface water monitoring* – state, federal and local agencies conduct infrequent surface water monitoring of Mill Creek. Most water quality data available is project or assessment based with large data gaps in between samplings.
- *Needed surface water monitoring* - Regular sampling of nitrogen, phosphorus, bacteria, and sediment (as TSS or turbidity) in the Mill Creek Watershed is recommended, at minimum, on a quarterly schedule to establish a baseline and progression of watershed impacts. Consistency in which analytes are measured (e.g. nitrate and nitrate or nitrate+nitrite; total nitrogen or Total Kjeldahl Nitrogen) between agencies and projects would allow the tracking of trends over time for these nutrients. Targeted sampling in areas with CSAs is recommended to validate the model and effectiveness of implemented practices.
- *Field level runoff monitoring* - Installation of EoF monitoring sites are encouraged in areas identified as medium-high and high CSAs testing recommended water quality practices (Table 3 and 4).

Tracking Data Metrics and Trends over Time

To assess the short- and long-term impact of NRCS actions in the watershed, local NRCS offices are required to review and report on metrics for each NWQI watershed. It is recommended that

NRCS review existing local water quality data on at least an annual basis in conjunction with their annual metrics of planning and practice implementation to track metrics of success. A process for identifying, tracking, and reporting on key metrics will be coordinated between the local NRCS staff and the WWCCD. This metric tracking and reporting process will consider all NWQI watersheds in Walla Walla County such that similar metrics are being tracked and reported for each watershed.

The recommendation of this assessment is that annual reports be prepared locally and build on **existing** frameworks for tracking both conservation practice implementation and water quality. The level of detail and format of these reports should be agreed upon by local NRCS staff and their colleagues at the national level.

The current layout of existing water quality monitoring stations may not be broad enough nor consistent enough to get a comprehensive assessment of NRCS activity impact, but it can provide some metric of impact when assessed in conjunction with other data sources and non-NRCS activities within the watershed.

Metrics to be tracked and reported on *may* include:

- Three-year trends, annual and/or seasonal data of water quality results for key watershed monitoring stations. Key stations will be identified such that they show water quality patterns within the upstream most agricultural areas of the Mill Creek Watershed.
- Metrics of NRCS work in the watershed over the past year, including number of clients, acres treated, and practices planned and installed.
- A brief description of important watershed successes or challenges over the past year that provide context for other metrics being tracked. This could include, for example, updates to the Mill Creek Flood Control Project (MCFCP), new partnerships, regulatory activities, TMDL updates, or significant flooding events.

Planned Alternatives:

According to the 'Draft Reassessment Report Mill Creek Floodplain Improvements- Phase 1' (October 2022, Anderson Perry for WWCCD), the hydraulic model results for Mill Creek show that most of the valley bottom is currently utilized by the 100-year peak flow event. The areas of the valley bottom not utilized by the 100-year peak flow event are dominated by residential structures and public infrastructure. Large areas of additional floodplain that can be utilized without removing residential structures or public infrastructure do not exist. Due to the nature of Mill Creeks increased flooding, conservation easements have potential to offset development, improve water quality, and protect infrastructure. Conservation easements could remove existing pastures to higher elevation regions thus reducing potential nutrient input. Installing grass lined swales to act as flood high flow channel or thicker and wider riparian regions are management strategies that would require higher incentive payment rates. The floodplain width is completely occupied and the region that it can be expanded has already existing infrastructure, this is justification for higher incentive payment rates.

According to Walla Walla County GIS records, since 2018 there has been 1,893 parcels out of 9,284 parcels have been sold and new landowners are disconnected from agricultural programs. The lack of education and knowledge for NRCS practices and rural living plays a role in serving our community. Providing expert advice for small acreage farmers, clean water for horses, native plant landscaping, and pasture management through workshops would increase awareness for conservation practices along with initiate a collaboration with WSU Extension office. The WSU Extension office for Clark County offers a very robust Small Acreage program. This program offers webinars and talks on ranging from living on the land to well and septic systems. Partnering with our local extension office to replicate and initiate a well-rounded outreach program to assist landowners in applying best management practices on their land. In addition to partnering with WSU Extension there is potential to work with Walla Walla County Public Works regarding pressing development. WWCCD could provide tools for the counties planning department by assisting the county with data and tools acquired from recent Mill Creek projects.

5.4 NEPA Concerns

The National Environmental Policy Act (NEPA) of 1964 requires all federal agencies to conduct an environmental review of all federal actions including area wide or watershed planning activities. As part of these plans, the responsible federal agency is required to evaluate the individual and cumulative effects of the actions being proposed. Any project that has significant environmental impacts must be evaluated with an Environmental Assessment (EA) or Environmental Impact Statement (EIS) unless the activities are eligible under a categorical exclusion or are covered by an existing EA or EIS.

NRCS utilizes a planning process that incorporates an evaluation of potential environmental impacts using an Environmental Evaluation checklist. NRCS also has Categorical Exclusions (CEs) available for several different activities that include many of our recommended conservation practices. These CEs include conservation practices that “mitigate soil erosion, sedimentation and downstream flooding” (NRCS, 2016).

The “Lower Mill Creek Final Habitat and Passage Assessment” (CTUIR, 2017) outlines several system-wide management scenarios with a long-term focus on enhancing ecosystem benefits and flood control. The Primary Focus Area included the Lower Mill Creek segment from river mile 0 to 15, or, from Mill Creek’s confluence with the Walla Walla River to 7 Mile Bridge, which also encompasses the area of this watershed assessment. The CTUIR’s assessment provides a system-wide approach to recommending the implementation of conservation practices and actions that improve conditions for fish while improving flood control function. These practices include a number of conservation practices that are covered by Categorical Exclusions, some good examples are riparian buffers, filter strips and conservation cover. Figures 16-20 should be used to identify the top land uses and areas in the watershed that should be targeted for practice selection and implementation to increase effectiveness of plan implementation.

As part of the planning process, each planned practice will be evaluated individually and in combination with other planned practices to ensure it meets the criteria of the Categorical Exclusions and any existing Environmental Assessments. Any significant negative practice impacts, either individually or cumulatively, will first try to be avoided, then mitigated or eliminated from the individual farm plan, if necessary. Practices planned for implementation in the Mill Creek Watershed are not expected to require an Environmental Assessment or an Environmental Impact Statement.

OUTREACH

6.1 Outreach Plan Goals and Objectives

This Watershed Outreach Plan for the Lower Mill Creek Watershed is designed to increase participation in conservation programs and implementation of conservation practices by focusing outreach on the lands and landowners with the highest probability of adoption and biggest potential impact on water quality. To date, the majority of cooperators for Natural Resource Conservation Service (NRCS) Environmental Quality Incentives Program (EQIP) and National Water Quality Initiative (NWQI) programs have been wheat producers, so this plan also focuses on building messaging and materials to engage and enroll previously underrepresented agricultural types that can have a large impact on water quality.

The objective of this plan is to provide the framework to develop outreach materials to inform and educate target landowners of the technical assistance and tools available to them by considering their values, communication preferences, and trusted sources of information. Outreach goes beyond just informing the public and stakeholders about watershed conservation goals, but rather informs NRCS and partners about issues, barriers, and preferred practices for the watershed, then focuses on the specific audiences that can create the biggest benefit to watershed help.

6.2 Strategy

The strategy to reach a large audience of community members within the area of interest was accomplished through sending out 100 postcards that had a QR code on the card and emails. The QR code was linked to a survey for landowners to fill out online. Hard copies could be requested as well through email. The survey was developed to capture landowners' familiarity with NRCS Conservation Practices, willingness to participate in the practices, and barriers associated with adopting the programs. The community members were restricted to landowners that lived along Mill Creek withing existing and future related Mill Creek projects. The survey also captured any gaps in land use practices that the Conservation District has not been able to assist with.

Distribution of the survey through our local newspaper, The Union Bulletin and through our website with a map indicating the projects boundaries. In addition to landowner outreach, the Walla Walla County Conservation District presented a summary of NWQI and other Mill Creek projects to local, state and federal agency partners. These groups included the Mill Creek Work Group, Snake River Salmon Recovery Board, Walla Walla Basin Advisory Committee (part of the Walla Walla Watershed 2050 plan), and the Walla Walla County Voluntary Stewardship Program local working group. Capturing survey responses was minimal through this means of promotion. Finding adequate strategies to promote and receive responses for the survey was met with many hardships. The Walla Walla community is widely dispersed and the community does not have general collective means to receive news and information. This created a hurdle for finding concrete ways to receive responses for those who specifically live in the area of interest. Having the survey widely dispersed and viewed has been the main obstacle with the outreach portion of this project.

Different outreach avenues need to be further explored to reach more landowners within this region. According to the Whatcom Conservation District Farm Planning Customer Service

Satisfaction Survey distributed to community members, 52% of respondents heard about services by "word of mouth". Due to COVID and restriction of in person events, the Conservation District has been limited in their outreach capabilities. In addition to community members limiting their physical interactions, word of mouth sharing was minimal. In person events and workshops would allow our target audience to have access to the survey and other resources the Conservation District offers. Another avenue is determining reliable social media forums that community members use to obtain information and share information. Outreach efforts were combined in collaboration with other ongoing projects to acquire more survey responses and feedback relating to NRCS Conservation Practices within this region.

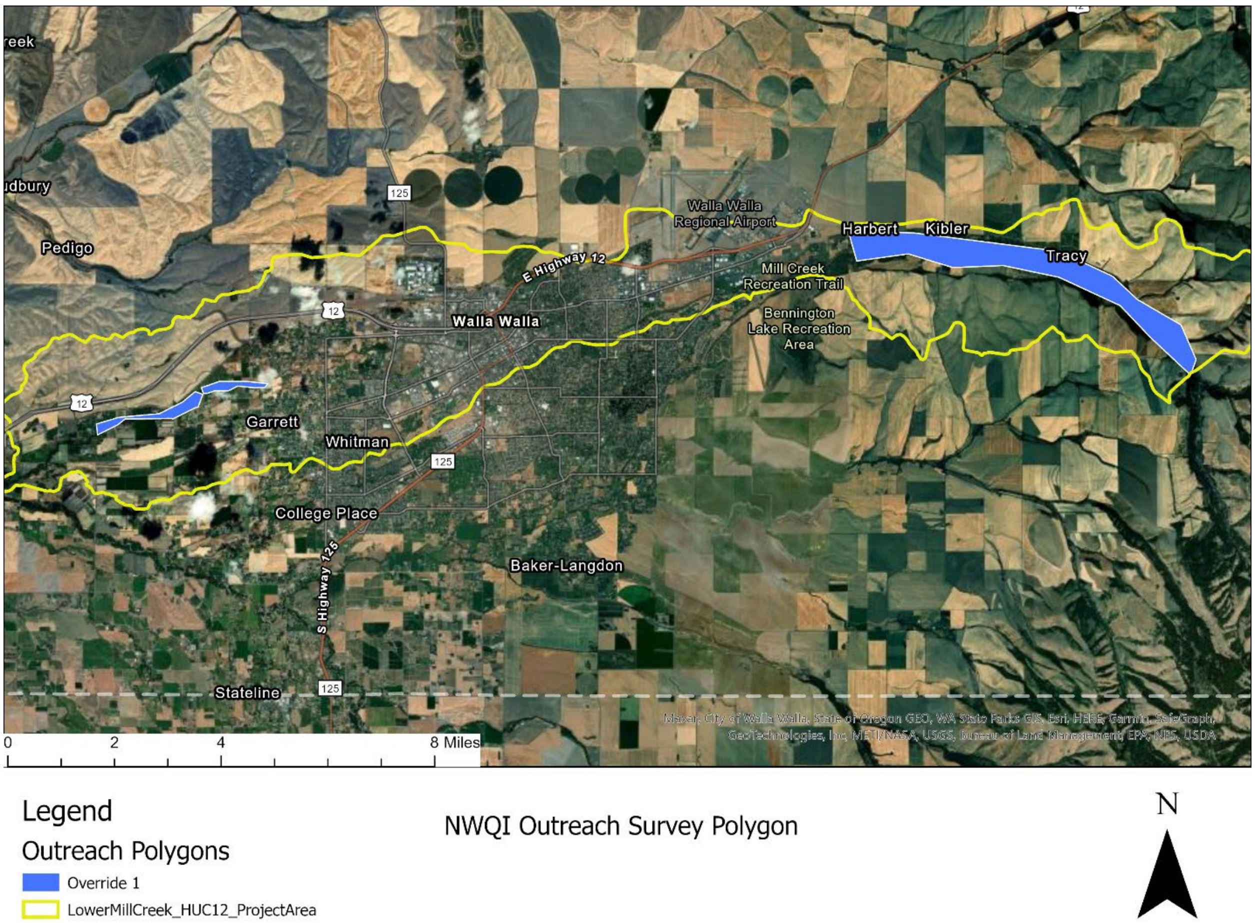

Figure 21: Lower Mill Creek area of interest with outreach polygons for NWQI survey.

Landowner participation is limited by lack of knowledge of USDA programs and eligibility. With 97% of parcels in the watershed having farm and track numbers indicating involvement in past USDA programs. According to Walla Walla County GIS records, since 2018 there has been 1,893 parcels out of 9,284 parcels have been sold and new landowners are disconnected from agricultural programs.

For example, the Walla Walla County Conservation District hosts a series of annual neighborhood mini-sessions with USDA partners. The Mill Creek area has had the highest decline in participation compared to other neighborhoods with less than a handful of landowners or farmers in attendance the last 5 years.

Possible tactics to connect with these landowners may include the following:
- Offer consistent community meetings (awareness/ education) either monthly or quarterly. Tie these meetings seasonally according to the threat of hazards such as promoting erosion reduction and instream grade control structure conservation practices during late spring, or fuels reduction practices during dry, fire prone late summer months. Efforts to promote fuels reduction programs after the first fall rains have arrive fall flat.
- Provide a dedicated staff for outreach. NRCS technical staff are predominantly working on contract management. Field technical assistance is vital to establishing trust with new landowners. This would need to include a brief primer on what to expect (timeline, ranking, likeliness of specific BMPs to be funded) from USDA programs.
- Break out of 'preaching to the choir' current NRCS employees share information through email or annual local working group meetings. These methods are great for reaching landowners who are already involved in NRCS programs but not to reach new landowners.
- Prove your worth. Landowners may be untrusting of government agencies. Unfortunately, landowners cast a broad net over government agencies regardless of who is a regulatory agency compared to who is a technical provider.

6.3 Analysis

A total of 8 responses were received from the online ArcGIS Survey 123. A total of 18 questions were asked regarding familiarity of NRCS conservation practices, greatest threats to water quality, willingness to participate in NRCS conservation practices, and trusted sources of information. According to the results 50% of landowners feel that bank erosion is the greatest threat to water quality and 37.5% feel that soil erosion is the greatest threat to water quality. The survey asked if clean water is important for livestock, drinking, and recreation, 100% replied yes to this question. The results for receiving accurate sources of information displayed that 75% of landowners use NRCS, 62.5% use WSU Extension, and 50% use WWCCD. The landowners were allowed to select up to 5 responses for this question.

Landowners were asked their familiarity and experience with a NRCS conservation practices and land management practices associated with land uses. Wildlife plantings has the highest familiarity at 75% then weed control at 62.5%. Brush management is at 50%. Grazing and fence access control are both 37.5%. Willingness to participate in these projects was consistent however out of pocket expenses was unanimous as barriers to participate. With nearly 2/3 of the responses not having farm records, there is a challenge to provide services to those smaller acreage or hobby farms along Mill Creek that do not currently work with USDA programs. This was asked because in order to qualify to be enrolled in NRCS conservation practices the landowner needs to have established farm records.

Additional questions asking landowners what further topics would they like to learn about revealed more information regarding Mill Creek. The topics were reinforcing Mill Creek's banks to reduce erosion and improve floodplain functionality. The Conservation District is actively working on projects along Mill Creek that target these issues.

In Figure 22 the amount of Common Land Unit is displayed along with land use characterization within the Mill Creek area of interest (AOI). Data obtained through NRCS, indicates that 17,673.85 acres out of 18,172 acres have farm and tract data established with FSA in the AOI. This indicates that at some point these parcels contacted FSA to enroll into a program. This data does not reflect current or active accounts that are enrolled into an FSA or NRCS programs. When a parcel has an existing farm and tract numbers the enrollment into a NRCS program is easier. This existing data allows the Conservation District to target and assist land owner's with implementing NRCS Conservation Practices.

The general synopsis of the results prove that landowners are willing to participate in conservation practices if funding was made available through grants or cost shares rather out of pocket expenses. Landowners are familiar and aware of several NRCS conservation practices that impact water quality. The Conservation District is a trusted and reliable source of information for land management as well as NRCS and WSU Extension. Ultimately having a more robust outreach effort to acquire more responses to gain a better understanding of the community's needs is necessary. This survey captured a small population of residents however, the responses did reveal that there is need to implement conservation practices along Mill Creek.

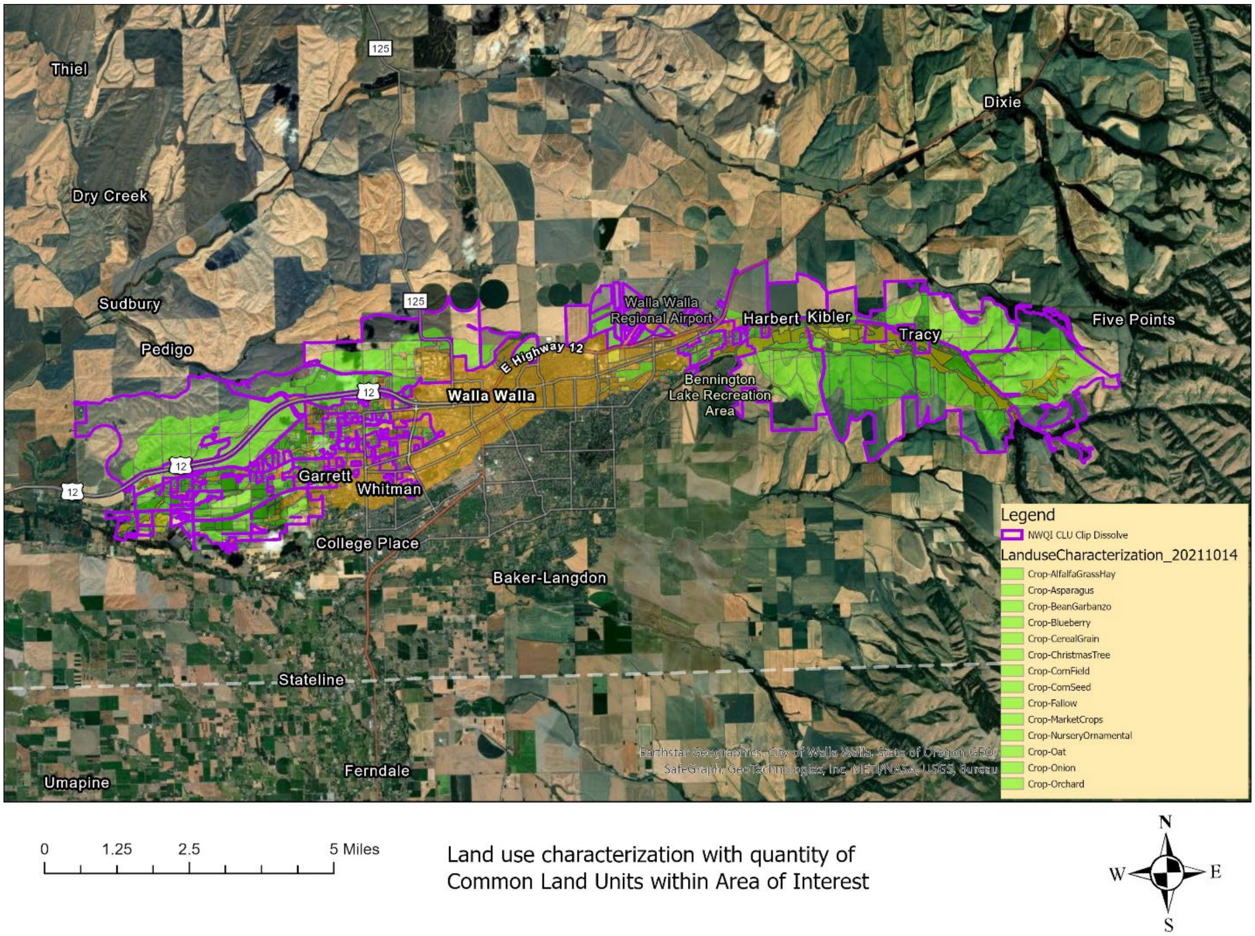

Figure 22: Land use Characterization with quantity of Common Land Use (CLU) within area of interest.

6.4 Partners in Outreach

Development and implementation of the outreach plan for the Lower Mill Creek watershed will involve partners to ensure the plan is supported throughout the watershed. Below is a list of local partners who have been identified as trusted messengers of information and should be engaged in the communication and outreach effort to ensure broader sharing and success in water quality goals.

Agricultural Audience Focus

Natural Resource Conservation Service

The Natural Resource Conservation Service (NRCS) conservationists provide technical expertise, conservation planning, and distribute financial assistance for farmers, ranchers and forest landowners wanting to make conservation improvements to their land. The Walla Walla USDA Service Center provides services for Walla Walla County including the Lower Mill Creek Watershed.

Walla Walla County Conservation District

The Walla Walla County Conservation District (WWCCD) believes that complex environmental problems can be solved through voluntary cooperation rather than by regulatory mandates. WWCCD does this by providing education, information, and assistance to create and then implement proactive programs that respect both the needs of the landowners and the natural resources of the County.

Washington State Department of Agriculture

Washington State Department of Agriculture (WSDA) has a variety of services related to pesticide licensing, dairy nutrient compliance, soil sampling, invasive species awareness, and select water quality sampling.

Washington State Department of Ecology

Washington State Department of Ecology, Water Quality Program works directly on non-dairy agriculture, Water Pollution Control Act (RCW 90.48) compliance. Regulatory staff monitor water quality, identify sources of preventable fecal bacteria pollution from non-dairy agricultural properties, and offer residents technical help to fix pollution sources. Staff may use enforcement authority when a landowner is unwilling to act to fix an identified and preventable fecal bacteria pollution source.

Washington State University Extension

For nearly a century, WSU Walla Walla County Extension has worked with local agriculture producers to bring research-based information to improve the productivity, efficiency, economic well-being, and safety of products produced in this diverse agricultural community. WSU Extension is a local trusted resource and has active 4H and Master Gardener programs.

Washington Cattlemen's Association (WCA)

According to the WCA website, in 1925 the Washington Cattlemen's Association developed a statewide, grassroots organization that devoted itself to promoting agriculture and the cattle industry and today, 95 years later, that remains the hallmark of our association. They have dedicated ourselves to preserving, protecting, and promoting the beef industry through producer and consumer education, legislative participation, regulatory scrutiny, and legal intervention. In terms of preserving, protecting, and promoting the cattle industry of Washington, WCA is leading the charge. WCA is, and continually strives to be, the respected voice of Washington’s cattle industry. WCA works daily on the issues that are important to Washington cattle producers at both state and national level.

Local Farm Suppliers:

Local farm suppliers such as but not limited to are Wilbur-Ellis Company, Nutrien, and Hellena serve local farmers in Washington, Idaho and Oregon with the seed, crop inputs, equipment, research and advice needed to raise healthy crops.

Non-Agricultural or General Audience Focus

Walla Walla County Public Works

The Walla Walla County Department of Public Works consists of a diverse staff of 59 engineers, surveyors, construction and GIS Specialists, equipment operators, road maintenance crews, mechanics and professional support staff operating across 1300 square miles in Southeast Washington. The Public Works Department is responsible for the planning, engineering, design, construction, operation and maintenance of approximately 1000 miles of county roadways, 200 bridges and over 5 miles of flood control channel. Department staff also coordinates new development transportation infrastructure design and construction, provides county-wide GIS support, and oversees the County stormwater management program.

Walla Walla County Emergency Management

The Walla Walla Emergency Management Citizen Alert system is able to alert residents about severe weather, fires, floods, toxic environmental issues, radiological events and other emergencies.

References:

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2. Bjorkland, Ronald & Pringle, Catherine & Newton, Bruce. (2001). A Stream Visual Assessment Protocol (SVAP) for Riparian Landowners. Environmental monitoring and assessment. 68. 99-125. 10.1023/A:1010743124570.
3. City of Walla Walla. 2016a. Draft Shoreline Master Program Update. January 2016.
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6. Ecology. 2016d. Water for Fish Survival. Available online at http://www.ecy.wa.gov/programs/wr/cwp/cr_fish-1.html
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APPENDICES

Appendix A. Inputs to the spatial model. Each input represents a geographic information systems (GIS) data layer.

Feature	Description	Categories and associated ranking (1-5)	Data Source
Terrain Features			
Slope	Average slope of 100 ft by 100 ft area derived from LiDAR images. Slope categories are based on those used by Schilling et al. 2015.	0-1% slope= 1 1.01-2% slope = 2 2.01-5% slope =3 5.01-10% slope = 4 >10% slope = 5	Derived from WA DNR LiDAR
Soil drainage class	Drainage class from NRCS soils layer	Gravel, Somewhat Excessively drained = 1 Well drained, Moderately Well drained = 2 Somewhat poorly drained = 3 Poorly drained = 4 River wash, Very poorly drained = 5	NRCS Soils- obtained in October 2021
Precipitation	Annual rainfall (inches)	Less than 40= 1 40.01-46 = 2 46.01-50 = 3 50.01-54 = 4 54.01-58 = 5	Texas A&M University and confirmed by WWCCD annual precipitation data compiled over 80 years- obtained in October 2021
Proximity to waterways	Distance to waterways defined by waterway buffers within GIS. A shorter distance to a waterway is reflected as a higher ranking score.	100- 180 feet =1 81- 100 feet = 2 41-80 feet = 3 11- 40 feet = 4 Less than 10 feet = 5	https://www.usgs.gov/national-hydrography/watershed-boundary-dataset obtained in October 2021
Flooding potential	FEMA flood maps categorized by flood zones (Percent annual flood risk corresponds to 500-year and 100-year floodplains)	Less than 0.2 % annual flood risk = 1 0.2% annual flood risk = 2 1% annual flood risk = 3 Regulatory floodways = 5	https://msc.fema.gov/portal/search?AddressQuery=walla%20walla%2C%20wa#searchresultsanchor obtained in October 2021

Feature	Description	Categories and associated ranking (1-5)	Data Source
Land cover Features			
Land use category	WWCCD classifications based on Walla Walla County and USDA layers, aerial imagery, and windshield surveys	28 categories (see Appendix B for categories and associated pollutant rankings)	Walla Walla Conservation District 2021
Presence of livestock	Properties with livestock determined by windshield surveys, WWCCD staff 2021	No livestock observed = 1 Livestock observed = 5	Walla Walla Conservation District 2021
Miscellaneous			
Watersheds	Watershed boundaries based on LiDAR and National Hydrography Dataset (NHD)	NA	https://www.usgs.gov/national-hydrography/watershed-boundary-dataset obtained in October 2021
Parcels	Walla Walla County parcel layer	NA	https://wallawallacountygis-wwcgis.hub.arcgis.com/apps/b19caa722a614b87bba33741bf64c88d/explore obtained in October 2021

Appendix B. Land use categories with associated pollutant rankings and definitions.

Land Use Category		Pollutant Rankings					Definition of Land use Category
Primary	Secondary	Phosphorus	Nitrogen	Sediment	Pathogens	Combined	
Crop	Blueberry	2	4	3	1	3	Blueberry crop, all varieties and management.
Crop	Caneberry	2	4	4	1	3	All caneberries including raspberry, blackberry, currant.
Crop	Corn	4	4	4	4	4	All corn varieties including silage corn and sweet corn.
Crop	Fallow	2	2	5	1	3	Uncultivated land with no crop growing or field that has been plowed/harrowed but not planted in a crop for at least an entire growing season; not in short term transition to a second crop.
Crop	Forage	5	5	2	5	5	Perennial grass or other forage crop grown and harvested for silage or hay with at least one seasonal cutting; likely to have had at least one seasonal manure application; category does not include seasonal cover crop.
Crop	Pasture	4	4	4	4	4	Field is being managed as grazing land for the majority of the year; animals are actively grazed on the pasture; field can have one seasonal forage harvest but must primarily be used for grazing.
Crop	Potatoes	4	4	5	1	4	Potatoes actively growing in field, even if short term rotation.
Crop	Orchard	2	2	2	1	2	Any type of crop grown in an orchard, including, but not limited to, apples, pears, cherries, grapes, etc.
Crop	Nursey	1	1	2	1	2	A managed setting where plants are propagated and grown to a desired age or size.
Crop	Unmanaged	1	1	2	1	2	No, or very low, management of field. Typically, a "wild" grass stand is growing. Material not harvested annually.
Crop	Small grain	4	4	4	3	4	All small grain crops including wheat and barley.
Crop	Strawberry	2	3	4	1	3	Strawberry
Crop	Vegetable	2	2	2	2	2	All vegetable crops grown for commercial sales.
Crop	Other	3	3	3	3	3	Any other type of crop not categorized in this list.
Developed	Gravel	1	1	2	1	2	Gravel mining area, active or inactive.
Developed	Commercial Turf Grass	2	4	2	1	3	Managed and fertilized turf grass including commercial turfgrass, golf courses, parks, sports fields, and cemeteries. Not residential tuff grass.

Developed	Residential Turf Grass	2	3	1	1	2	Turf or lawn associated with residences; may be manicured and fertilized.
Developed	Roads	1	1	2	1	2	Paved, public roadways; does not include private, gravel or unmaintained roads
Developed	Commercial	1	1	2	1	2	Impermeable and permeable surfaces for commercial purposes, including businesses, industrial, driveway, and parking surfaces.
Developed	Residential	1	1	2	1	2	High or low density residential including impermeable (i.e., driveway, hardscaping) and permeable (i.e., lawn, garden) surfaces
Developed	Unmanaged	1	1	2	1	2	Unmanaged permeable areas associated with roadways, commercial, or residential properties.
Farmstead	Crop	1	1	2	1	2	A farmstead (i.e., buildings, house) associated with a crop farm.
Farmstead	Dairy	2	2	2	2	2	A farmstead (i.e., buildings, house, manure storage) associated with a dairy farm.
Farmstead	Other Animal	3	3	3	3	3	A farmstead (i.e., buildings, house, manure storage, heavy use area) associated with a livestock property (may include horses, beef cattle, pigs, goats, etc.).
Riparian/ Streambank	Riparian/ Streambank	1	1	2	2	2	Any area adjacent to a waterway or waterbody with permanent or semi-permanent vegetation.
Forest	Forest	1	1	2	2	2	Natural or managed forest stand.
Water	Water	1	1	1	1	1	Any waterbody including lakes, stream, river, or ditch (perennial or seasonal).
Wetland	Wetland	1	2	1	2	2	Seasonal or perennial wetlands.

Pollutant Rankings Key	
1	very unlikely to export pollutant (no pathway) / no or very low contribution
2	unlikely to export /low or very low contribution of pollutant
3	somewhat likely to export/ potential for a moderate contribution
4	likely export pathways/ potential for a moderate to high contribution
5	very likely an export pathways/ greatest contribution of pollutant

Appendix C: NRCS conservation management plan(s) identified for surface water quality protection by farmstead type.

Conservation Management Plan	Comprehensive Nutrient Management Plan	Nutrient Management Plan	Feed Management Plan	Grazing Management Plan	Integrated Pest Management Plan	Irrigation Water Management Plan	Conservation Plan
NRCS Code	102	104	108	110	114	118	199
Farmstead-Crop		X			X	X	X
Farmstead-Other Animal	X		X	X			X

Most effective NRCS conservation management practice(s) identified for surface water quality protection by farmstead type.

Conservation Management Practice(s)	Fence / Access Control	Access Road	Watering Facility	Stream Crossing	Nutrient Management	Brush Management / Herbaceous Weed Treatment	Agrichemical Handling Facility	Wildlife Habitat Planting	Heavy Use Area
NRCS Practice Code	382 / 472	560	614	578	590	314 / 315	309	420	561
Farmstead-Crop	X	X		X	X	X	X	X	X
Farmstead-Other Animal	X	X	X	X		X		X	X

Most effective NRCS Conservation Practice(s) identified for surface water quality protection by agricultural crop.

Conservation Management Practice	Conservation Cover/ Conservation Crop Rotation/ Cover Crop	Field Border	Riparian Forest Buffer	Filter Strip	Irrigation Water Management	Prescribed Grazing	Nutrient Management	Structure for Water Control
NRCS Practice Code	327/328/340	386	391	393	449	528	590	587
Crop-Alfalfa Grass Hay	X	X	X	X	X		X	X
Crop-Asparagus	X	X	X	X	X		X	X
Crop-Garbanzo Beans	X	X	X	X	X (if irrigated)		X	X (if irrigated)
Crop-Blueberry	X	X	X	X	X		X	X
Crop-Cereal Grain	X	X	X	X	X (if irrigated)		X	X (if irrigated)
Crop-Christmas Tree	X	X	X	X	X		X	X
Crop-Field Corn	X	X	X	X	X		X	X
Crop-Seed Corn	X	X	X	X	X		X	X
Crop-Fallow	X	X	X	X	X		X	

Crop-Market Crops	X	X	X	X	X		X	X
Crop-Nursery Ornamental	X (Outdoor)	X (Outdo or)	X	X (Outdoo r)	X		X	X
Crop-Onion	X	X	X	X	X		X	X
Crop-Orchard	X	X	X	X	X		X	X
Crop-Pasture		X	X		X	X	X	X
Crop-Pea	X	X	X	X	X (if irrigated)		X	X (if irrigated)
Crop-Poplar	X	X	X	X	X		X	X
Crop-Soybean	X	X	X	X	X (if irrigated)		X	X (if irrigated)
Crop-Vineyard	X	X	X	X	X		X	X