Compensation Planning Framework
Quil Ceda Watershed

Quil Ceda Village
Fee In-Lieu Program

NWS-2009-00024-SO

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Overview

This Compensation Planning Framework is undertaken for the Quil Ceda Village In-Lieu Fee Compensatory Mitigation Program, for approved wetland impacts under Department of Army or Tribal permit, within Quil Ceda Village boundaries. This plan is produced in consideration of wetland and aquatic resource type and functions and services provided by wetlands within Quil Ceda Village boundaries.

Several watershed planning documents have been prepared in the past twelve years for the Quilceda watershed. The Tulalip Tribes completed a Tulalip Watershed Management Plan in 1996. Snohomish County Surface Water Management published the Quilceda/Allen Watershed Management Plan in 1999, in cooperation with the City of Marysville, Tulalip Tribes and a host of other agencies and citizens groups. Snohomish County also prepared the Drainage Needs Report, with its section on Quilceda Watershed, in 2002. The WRIA 7 Salmonid Habitat Limiting Factors Analysis was published in 2001, by the Washington State Conservation Commission, with assistance of Snohomish County staff, Tulalip Tribes, Washington Department of Fish and Wildlife, and Snohomish Conservation District, among others. These documents incorporated a large amount of resource inventory, Arc GIS analysis, field studies, and data gathering of stream habitat conditions, wetland inventory and condition, water quality data, flooding evaluation, and storm water modeling. They also provide management recommendations for protecting salmon habitat and its accompanying hydrologic and ecosystem functions within a rapidly urbanizing area.

This Planning Framework summarizes these various documents and is updated with watershed information gathered from stakeholder groups and agencies that are working in aquatic restoration in the watershed, as well as from Tulalip Tribes own resource inventories and databases. The management recommendations and watershed goals were reviewed with these parties and also updated. A majority of the goals and recommendations stand true today, and were only further confirmed by inventory that has been completed since 1999.

Geographic Service Area

The project impact area for which this in-lieu fee program is established is located within the boundaries of the municipality of Quil Ceda Village, on the Tulalip Indian Reservation. The geographic service area or receiving area for compensatory mitigation projects of this in-lieu fee program is the Quilceda Watershed, including all of its tributary areas: Sturgeon and Coho Creek, the West Fork, Edgecomb, Hayho, Olaf Straad, and Mainstem and Middle Fork Quilceda Creek subwatersheds. The Quilceda Watershed includes parts of the Tulalip Reservation, City of Marysville, parts of City of Arlington, and unincorporated Snohomish County. Due to the expanse of the watershed across jurisdictional boundaries, it is understood that in the event projects are to be implemented outside of Tulalip Reservation boundaries, on non-Trust Indian Lands, the State of Washington, Snohomish

County or City of Marysville or Arlington may be involved at the project permitting stage. **(See Figure 1 and Figure 6).**

The Quilceda Creek watershed is located north of the Snohomish River near its mouth, and joins the River at Ebey Slough on the Tulalip Reservation. The watershed extends from the Snohomish River to Arlington, with a gradual increase in elevation from sea level in Marysville to 120 feet in Arlington. The total drainage area is 23,850 acres (Carroll, 1999) (Snohomish County, 2002).

For the purposes of the in-lieu fee instrument, the watershed is divided into the sub-watershed basins of:

- Coho and Sturgeon Creek,
- West Fork Quilceda Creek,
- Middle Fork Quilceda Creek,
- Mainstem Quilceda Creek

Expanding the receiving areas for mitigation projects to the greater Quilceda watershed is partially due to the small area of the federal city. The Tulalip Reservation boundary extends north from Quil Ceda Village within the West Fork Quilceda subwatershed. The West Fork Quilceda Creek flows through Quil Ceda Village to its confluence with Quilceda Creek, approximately 2 miles upstream of Coho Creek's confluence, in the lower watershed. The subwatershed area has a close connection and similarity to the Quil Ceda Village project area. The project impact area is also similar in geology and hydrology to the remaining sub-watershed basins of the Quilceda Watershed, (i.e. it is located within the Marysville trough and the trough sandy recessional outwash sediments, and has similar issues of groundwater recharge, wetland loss and urbanization). Although the Quil Ceda Village is the project impact area, extending the service area to the greater Quilceda watershed makes ecological sense and will allow for viable projects to be developed if none are available within the Sturgeon Creek, Coho Creek or the West Fork Quilceda Creek within a suitable time frame. Extending the service area to the greater Quilceda watershed will also ensure that adversely affected wetland functions and services may be replaced by functions of equal or greater value, as determined on a watershed basis, by providing a greater pool of project sites. It will also afford the opportunity for cooperative funding with other jurisdictions should projects arise that would meet this Fee In-Lieu's program goals and criteria. However, it is expected that a majority of mitigation projects will occur west of Interstate 5 within the sub-watersheds of Sturgeon, Coho or West Fork Quilceda Creek. (See **Figure 1**)

Because the project impact is located within The Tulalip Tribes' city of Quil Ceda Village, first priority for use of in-lieu fee mitigation dollars will be given to projects within Quil Ceda Village boundaries, in the Coho and Sturgeon Creek watersheds, then to projects within the West Fork Quilceda Creek watershed within Reservation boundaries. Last priority will be given to projects outside of Reservation Boundaries

Figure 1: Map of the Fee In-Lieu Service Area Subwatersheds

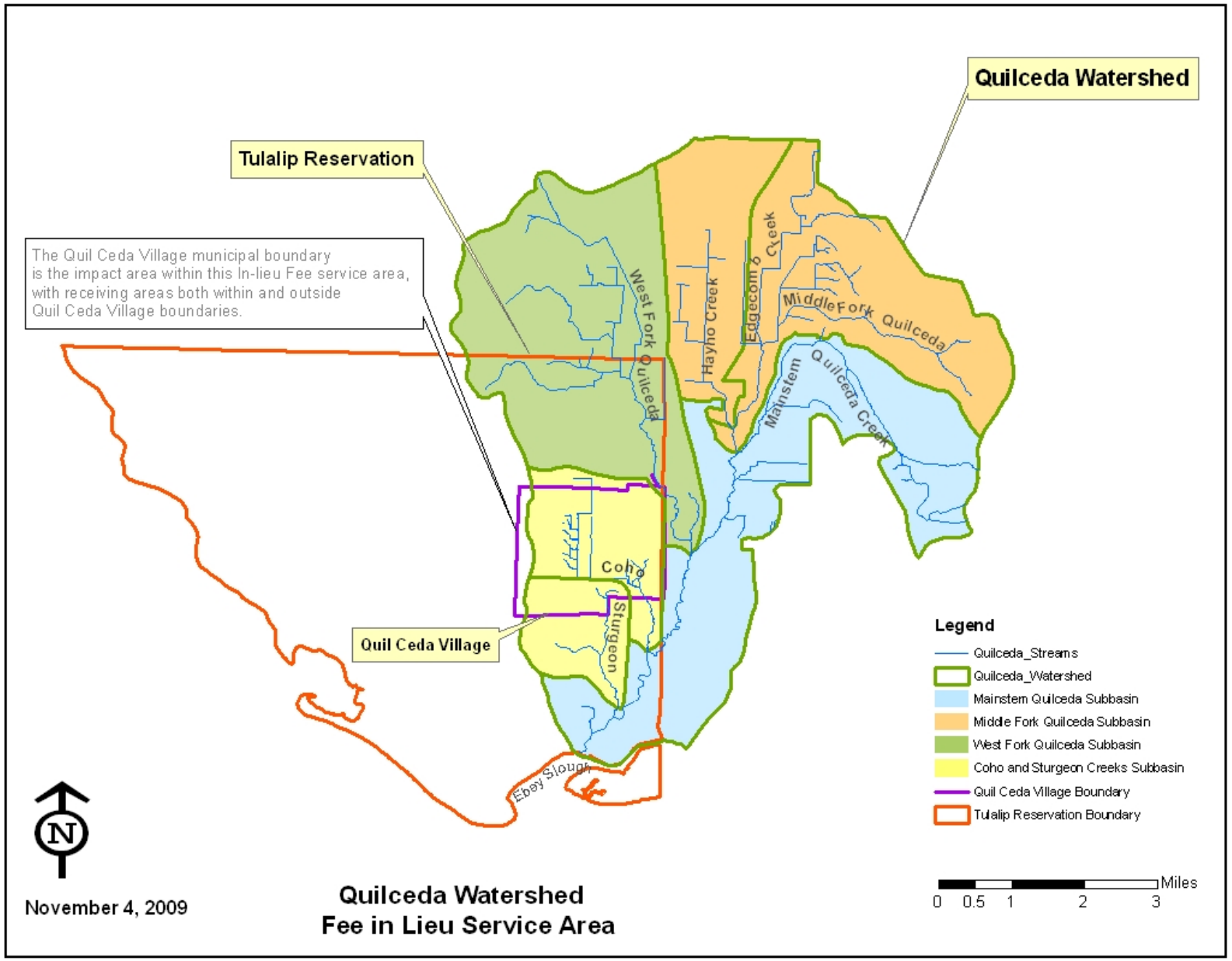
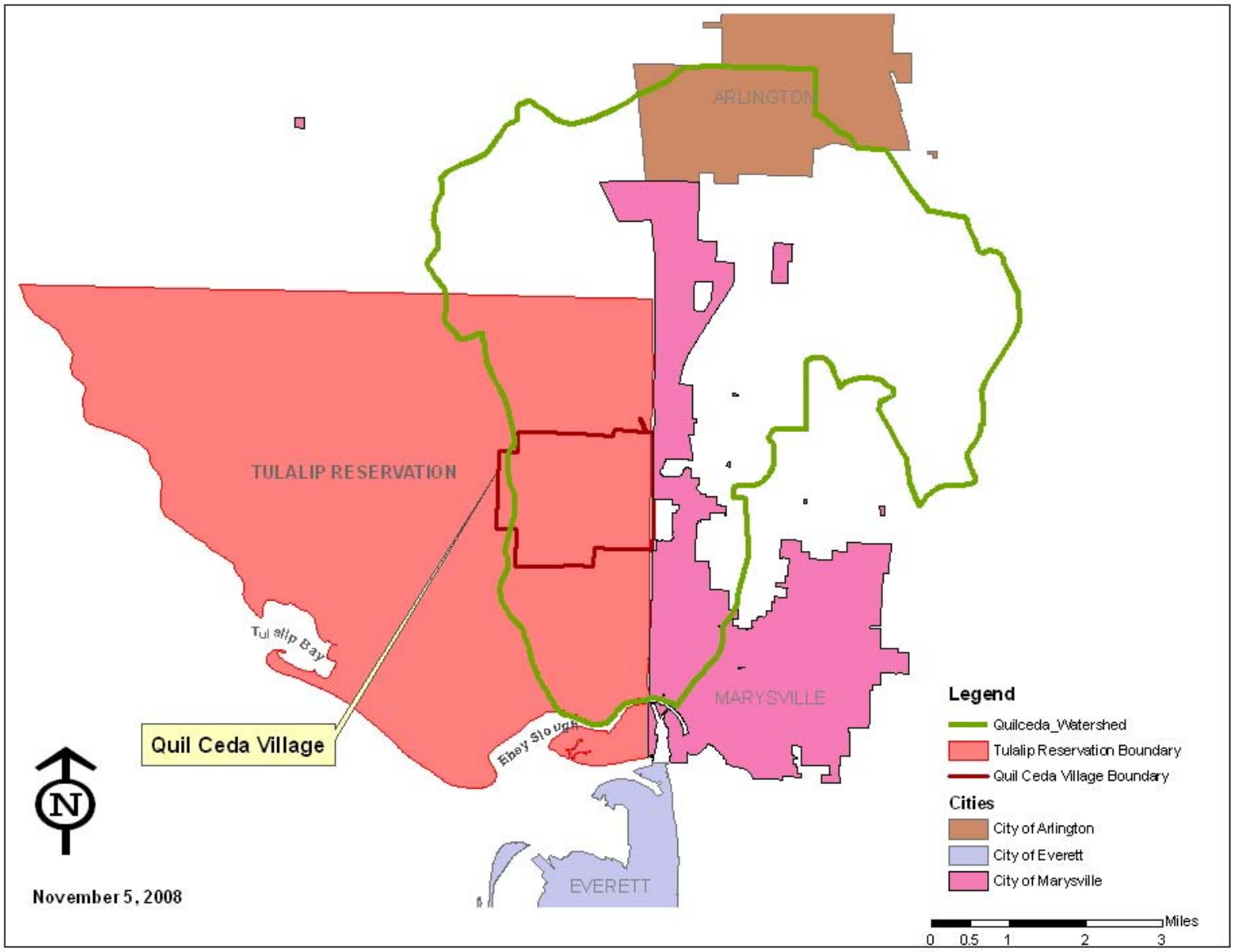


Figure 2: Jurisdictional Boundaries in the Quilceda Watershed



within the greater Quilceda Watershed., If projects are not available and if project funds cannot be expended within Quil Ceda Village or Reservation properties, within the appropriate timeframe, or if projects of a higher priority are determined by Quil Ceda Village to be located outside of Reservation boundaries, proposals for projects within the greater Quilceda watershed may be considered for use of in-lieu fee mitigation funds.

Watershed Characterization

Quilceda Creek flows primarily through a broad valley area called the Marysville Trough, bordered by 400 to 500 foot elevation plateaus to the east (Getchell plateau) and west (Tulalip plateau). The headwaters of the Quilceda Creek originate on either side of the Marysville Trough, on the Getchell and Tulalip plateaus.

The West Fork Quilceda originates on the western side of the valley on the Tulalip plateau, and flows through the recessional outwash sand deposits of the Marysville trough valley to its confluence at River Mile 3.7 of the Quilceda. Sturgeon and Coho Creek headwaters also originate within the Tulalip plateau and flow through the sandy valley sediments to their confluence with Quilceda Creek within its tidally influenced portion, River Miles 0.9 and 1.9, respectively. Edgecomb, Olaf Straad and the mainstem and Middle Fork Quilceda Creeks originate on the east side of the valley, on the Getchell Plateau. Hayho Creek, a ditched stream within the City of Marysville, (formerly known as Smokey Point Channel West) is entirely comprised in the Trough valley. (See **Figure 6, Appendix A**)

The geology of the Marysville trough and its surrounding slopes are a major driver in the hydrologic patterns and functions within the watershed. While Tulalip and Getchell plateaus are comprised of glacial till materials known as the Vashon till, within the Marysville trough valley, thick glacial sands (up to 150 feet in thickness) were deposited as the glaciers retreated, on top of the same Vashon till. Ragnar and Custer soils, deep sandy soils, are the predominant parent material within the Marysville trough, along with Norma loam, a hydric soil found within depressional areas. In addition, a smaller portion of alluvial soils, Lynnwood soils are also found along stream margins and in the northern portion of the Marysville trough. Within the mouth of Quilceda Creek, Snohomish River floodplain soils of Puget silty clay loam are found. Alderwood and Tokul soils, gravelly sandy loams comprise most of the land on the plateaus. Overall 50 percent of the Quilceda watershed is comprised of hydric soils (Norma, Puget, Mukilteo Muck and Custer soils) (Carroll and Thornburg, 1998).Due to its geology, the Quilceda has a large unconfined, or water table aquifer within the Marysville Trough. On the Tulalip plateau, the Tulalip aquifer is a confined aquifer, which has been under study as a sole source aquifer. Within the Marysville Trough, groundwater generally flows in a south to southwest direction. Groundwater contribution to the mainstem Quilceda Creek ranges from 8 to 33 percent, with contribution to stream flow in the Middle Fork ranging from 67-83 percent. Groundwater is an important source of stream flow during non-storm periods (Snohomish County, 2002) (WSCC, 2002).

Snohomish County maintains a precipitation gauge in the Smokey Point area. Average annual precipitation in the watershed from water year 1996 to water year 2008 was 40.37 inches. Average annual rainfall reported in the Quilceda-Allen Watershed Management Plan was 35.09 inches for water years 1991 to 1996. On average the last eleven years have been slightly wetter than the previous 35 (Carroll, 1999) (Snohomish County Public Works, 2008).

Flooding is an issue in the Quilceda watershed. Flooding occurs as a result of the high regional water table in the Marysville Trough. During fall and winter, the water table is at or near the surface in hydric and Custer soils. The water table fluxuates rapidly in response to precipitation, creating a unique impact of groundwater on storm water runoff. The water table drops early in the spring to greater than 3 feet in depth (Boyer, personal communication) (Snohomish County, 2002) (Carroll, 1999).

Due to a high groundwater table, wetlands comprise a significant percentage of the Marysville trough area, with Custer and Norma soils comprising almost 50 percent of the area. More recent inventory conducted by Tulalip Tribes has revealed that a portion of the area mapped as Norma soils within the Coho and Sturgeon Creek watersheds is misidentified. However, approximately 30-40% of the area is still wetland. Wetland inventory conducted by City of Marysville indicated a large percentage of the Edgecomb and Hayho watersheds within the valley trough were historically wetland. (Boyer, personal communication)(Snohomish County, 2002)(Carroll, 1999) **(See Figure 7 to** Figure 11**, Appendix A)**.

Twenty-two percent of the Quilceda watershed is found within the Tulalip Reservation, approximately 7500 acres. Approximately one third of the West Fork Quilceda Creek watershed is within the Tulalip Reservation, or 2288 acres. Coho Creek and Sturgeon Creek are entirely contained within the Tulalip Reservation, east of Interstate 5. The headwaters of Coho Creek and Sturgeon Creek are found within Quil Ceda Village, a federal city within the Tulalip Reservation. Edgecomb Creek, Middle Fork Quilceda, and upper mainstem subwatersheds are mainly comprised within unincorporated Snohomish County and the City of Marysville, with the lower mainstem Quilceda primarily located within the City of Marysville See **Figure 2,** above**.**

Land Use

Population in Marysville doubled between 1989 and 1994, with increased residential developments occurring during this period. Land use in the Quilceda basin is nearly evenly divided between rural residential, agricultural, and urban residential land, with approximately 15% of commercial and industrial land. The upper reaches of the Quilceda Creek system consist primarily of agricultural and low-density rural land uses, whereas the middle and lower reaches consist of urbanized areas with moderate to high density residential, industrial, and commercial development (Carroll, 1999).

A land use study conducted in 2004 by Snohomish County showed a total increase of 97% in impervious surface within the Snohomish River Basin area from 1991 – 2001. According to that study, the Quilceda Watershed has seen the greatest increase in

impervious area within urban areas. (Snohomish Basin Salmon Recovery Forum, 2005) The Snohomish County Drainage Needs Report estimated total effective impervious area coverage in the basin to be approximately 2582 acres (7.8%) broken down as follows: Smokey Point 725 acres, Middle Quilceda 333 acres, Lower Quilceda 909 acres and West Quilceda 615 acres (Snohomish County, 2002). However, significant new developments have occurred within Smokey Point and in Quilceda Village since that time.

Primary land use changes since the Quilceda-Allen Management Plan have been increased commercial development in the Coho Creek, West Fork and Hayho Creek subwatersheds, and residential subdivisions within the Marysville UGA in the West fork, Middle Fork and Edgecomb Creek watersheds.

Species Information and Use in the Watershed

The Tulalip Tribes have maintained a smolt trap in Coho Creek immediately below 27th Ave NE since 2002. In 2004, 660 coho smolts, 154 chum fry and 1340 cutthroat were counted in the trap. In 2005, 69 coho smolts, 2575 chum fry, and 887 cutthroat were counted, with 651 coho smolts, 0 chum fry and 204 cutthroat counted in 2006. Coho production increased from zero to the 2004 count after the culvert under 27th Ave NE was replaced in 1999, to allow fish passage to approximately 2 miles of stream and restoration area north and west of 27th Ave NE. (Nelson, 2008a)

Chinook Salmon
Chinook salmon were listed as a threatened species under the Endangered Species Act on March 24, 1999, with threatened status reaffirmed on June 28, 2005. Critical Habitat was designated on September 5, 2005. Quilceda Creek, its outlet, and the Snohomish estuary is designated as Critical Habitat for Chinook salmon, with Tulalip tribal properties excluded from critical habitat. Critical habitat includes the water quality, channel and channel habitat features within the bankful width of the stream.

Use of Quilceda Creek system by Chinook salmon is reported to be relatively minimal, when compared to its use by coho and chum salmon, or to Chinook use in the Snohomish River system as a whole. This is likely due to the fine channel bed substrate within the Marysville trough area limiting spawning within the watershed. Limited Chinook spawning is located along the mainstem, approximately mid-basin. Chinook utilizing Quilceda Creek are of the Skykomish stock, an "ocean" type, with juveniles migrating downstream from April to early June, and utilizing estuarine and/or marine habitat before mid-July (WDFW, 2002)(The Watershed Company, 2006). The tidally influenced portion of the channel, up to approximately River Mile 3, would be utilized by Chinook smolts.

Puget Sound Steelhead
Puget Sound Steelhead were proposed threatened on March 29, 2005, and listed May 11, 2007 (72FR 26722). Steelhead (*Oncorhynchous mykiss*) are known to use the Quilceda

Watershed, however due to fine channel bed material, only small areas of the watershed are suitable for steelhead spawning. The Department of Fish and Wildlife lists summer and winter steelhead as rearing and presumed in Quilceda Creek. The smolt trap on Coho Creek has not shown any steelhead use in Coho Creek. The winter or 'ocean-maturing'' type enters freshwater between November and April for spawning. Since summer run steelhead usually only occur when habitat is not fully utilized by winter runs, it is unlikely that many summer run steelhead utilize Quilceda Creek.

Steelhead exhibit the most complex life history of any species of Pacific salmonid. *O. mykiss* can be anadromous (''steelhead'') or freshwater residents (''rainbow'' or ''red band'' trout), and under some circumstances, they can yield offspring of the alternate life history form. Anadromous steelhead can spend up to 7 years in fresh water prior to smolting, and then spend up to 3 years in salt water prior to migrating back to their natal streams to spawn. Steelhead may spawn more than once during their life span (iteroparous), whereas the Pacific salmon species generally spawn once and die (semelparous).

Coho Salmon
Puget Sound/Georgia Strait Coho salmon were listed as a species of concern under the Endangered Species Act on April 15, 2004. The listing does not confer any procedural or substantive protections of the ESA to the species. The Quilceda Creek watershed is within the boundaries of the Puget Sound ESU for coho salmon that is the subject of the listing. No critical habitat is designated.

Coho salmon utilize Quilceda Creek and all of its tributaries, including Coho and Sturgeon Creeks (WDFW, 2008). Coho in Quilceda and Coho Creeks are part of the Snohomish River stock, a mixed stock with wild production that is considered in healthy status as of the Salmonid Stock Inventory in 2002 (WSCC, 2002). According to Washington Department of Wildlife's Salmonscape digital data maps and City of Marysville, spawning areas are in the upper Quilceda mainstem, the Middle Fork, West Fork Quilceda and Edgecomb Creeks within the gravel stream bed alluvial fan areas at the base of the plateaus (WDFW, 2008)(City of Marysville, 2008a). Coho and Sturgeon Creeks do not have any significant spawning habitat; however restoration work undertaken by the Tulalip Tribes since 2003, has increased coho production from essentially nil to over 650 smolts in 2004 and 2006 (Data was not available in 2007 and 2008).

Rearing areas are throughout the valley portions of the watershed. A significant amount of rearing habitat is in ditched portions of streams within agricultural areas in the West Fork and Edgecomb Creeks. The Quilceda is noted as a primary coho-producing watershed. (Watershed Company, 2006)

Bull Trout
Bull trout were listed as threatened under the Endangered Species Act on June 10, 1998. The Quilceda Creek watershed, is within the boundaries of the Puget Sound ESU for bull trout, however, no critical habitat is designated within the Quilceda watershed,

likely due to its distance from known spawning areas The Quilceda is presumed habitat for bull trout, however due to its distance from known spawning areas and from suitable spawning habitat, it is likely only utilized by adfluvial fish for foraging.

Chum Salmon
Chum salmon spawn throughout the Quilceda watershed and its tributaries, including Coho Creeks. Chum salmon in the Snohomish watershed are a fall stock, and spawn November through December.

Coastal Cutthroat Trout
Quilceda Creek and its tributaries are host to the anadramous, and resident life history forms of the species. Cutthroat are found throughout the watershed

Fish habitat

Instream fish habitat was evaluated by the 2002 Quilceda Creek Drainage Needs Report study (Snohomish County, 2002). As noted above, substrate in Quilceda Creek has a high percentage of fines, qualifying it for "not properly functioning" status. This channel bed condition throughout most of the trough area is likely due to the surficial geology within the trough area. Gravel bed stream reaches are located within the alluvial fan and upper Edgecomb, Middle Fork and upper Quilceda Creek channels as well as a short reach of the West Fork on the Tulalip plateau (Nelson, 2008) (Snohomish County, 2002).

Large woody debris density, pool frequency and pool quality were also categorized as "not properly functioning." Pools were found to contain large quantities of sediment, and no off-channel habitat was noted in the report. Primarily limiting pool habitat is the lack of pool forming factors such as large wood, boulders or bedrock. Pool habitat was noted to be properly functioning in one surveyed reach of the West Fork, notably a forested parcel within the Tulalip reservation boundary that is relatively undisturbed. Stream bank condition was relatively good, with only 4.5 percent of surveyed stream banks noted to be unstable.

Spawning habitat located in the alluvial fan sections of Middle Fork, Upper Quilceda Creek and Edgecomb Creek is in good condition (Nelson, 2008). There are sections of the lower Middle fork and mainstem Quilceda through the middle third of the watershed that also have spawning gravels. Most of the rest of the watershed is primarily rearing habitat, due to the fine substrate of the channel bed. The West Fork Quilceda has only small sections of spawning gravels in the upper channel within the alluvial fan at the toe of the Tulalip plateau. Most of the channel is in sandy substrate and provides rearing habitat in ditched sections of the stream and its tributaries.

Quilceda Creek's extensive fish habitat can no doubt be attributed to its gradient class, which is pre-dominantly in the 0-1% gradient class for a majority of the mainstem, Middle Fork and West Fork stream reaches. The maximum gradient class, for short reaches in the slopes ascending the Getchell plateau, in the upper reaches of the Middle

Fork and mainstem, is 8-12%. A majority of the stream and its tributaries is found in 0-4% stream gradient classes.

Coho Creek has similar fine sand substrate to Quilceda Creek, with similar low gradient class. Both Sturgeon and Coho Creek are primarily wetland (i.e. rearing) habitat below 88th St NE, contained by numerous beaver dams.

The lower Quilceda Creek mainstem is tidally influenced to just upstream of Interstate 5, with excellent rearing habitat for outgoing Chinook and coho smolts within the estuary portions of the stream, on the Tulalip Reservation.

Riparian condition

The steep ravines and wide valleys associated with Quilceda Creek and its tributaries have created a protective buffer along most of the stream channels in the lower watershed (outside of agricultural areas). Although the majority of the mainstem Quilceda and Middle Fork Quilceda have a wide riparian corridor, with average 75 foot vegetated buffers (Carroll, 1999), the wide floodplain area and narrow steep bank walls have few large diameter trees available to channel recruitment. The vast majority of stream reaches surveyed for the Quilceda Watershed Drainage Needs Report had low large wood recruitment potential. And almost 50% of the watershed riparian areas are dominated by non-forest vegetation. In forested areas, trees are generally less than 12 inches in diameter. Stream shade within the Marysville UGA areas is approximately 50-50 in terms of potential for detrimental impacts from lack of shade[1]. (Snohomish County, 2002) Agricultural areas of the watershed have poorly vegetated riparian areas along ditched sections of stream.

Since the 1999 Quilceda-Allen Watershed Management Plan was written, Snohomish County Surface Water Management and the City of Marysville have continued to do riparian enhancement projects within the Middle Fork, and Edgecomb Creek. In 2004, Snohomish County completed 6 acres of riparian plantings on the Mainstem Quilceda Creek. The City of Marysville also has riparian and wetland enhancement projects in Hayho, Edgecomb and the Middle Fork Quilceda Creek, including 1 acre completed in 2003. In 2007, Snohomish County completed 1200 feet of riparian plantings and weed removal on a section of the Middle Fork Quilceda Creek near 140th St NE, just south of the confluence with Edgecomb Creek In 2008, the Adopt a Stream Foundation completed .60 acres of Riparian forest buffer enhancements. The upper watershed areas are most in need of riparian enhancement, within Edgecomb, Hayho, Middle Fork, and West Fork Quilceda Creek watersheds. Several opportunities were identified on maps at the October scoping meeting with AQWA team participants, and are shown on the Map of restoration opportunities **(See Figure 12 through Figure 15, Appendix A)**.

[1] However, water quality data from the City of Marysville, Snohomish Conservation District and Tulalip Tribes indicate that stream temperature is properly functioning for the majority of the watershed area, speaking perhaps to the importance of groundwater to stream flow in the watershed.

Wetland condition

The focus of a majority of the plans and studies within the watershed has been on hydrologic functions of wetlands, as well as riparian habitat and habitat values related to salmon and fish production. Wetlands have primarily been assessed for their value as water storage features in the watershed and connectivity to fish bearing streams. Wetland processes related to hydrology include the potential for reducing peak flows, the potential for decreasing downstream erosion, and the potential for recharging groundwater. Detaining and storing flood and storm water runoff within wetlands facilitates these processes (Hruby et al., 1999).Wetlands also provide feeding, rearing, and resting habitat for a variety of species including invertebrates, amphibians, birds, and mammals. Wetlands are also important for maintaining a gene pool of native plant communities. Within the Quilceda watershed wetlands associated to streams contain important habitat for different life-history phases of anadromous and resident fish species (Hruby et al., 1999).

An estimate of wetland aerial coverage and vegetation classes within the Quilceda watershed was determined in the Drainage Needs Report (Snohomish County, 2002). The Drainage Needs report did not assess wetland functions and values (or services*[2]) other than cover class. A total of 189 wetlands were assessed, totaling 1433 acres, or 6% of the drainage basin. Of these, 63 were hydrologically connected to streams (approximately 33% of the total). Of the classes identified for wetlands in the Quilceda Creek watershed, 28 percent were palustrine emergent (PEM), 27 percent were palustrine scrub/shrub (PSS), 21 percent were palustrine forested (PFO), 10 percent were palustrine aquatic bed (PAB), 9 percent were palustrine open water (POW), 3 percent were palustrine unconsolidated bottom (PUB), and 2 percent were estuarine wetlands. The Drainage Needs Report noted wetlands that were considered significant within the watershed, including some that were important reservoirs of native plants and wildlife habitat. A bog community dominated by Labrador tea was also noted within the West Fork Quilceda subwatershed. This same bog was identified in the Quilceda-Allen Management Plan as a target for acquisition **(See Figure 8, Appendix A)**.

Snohomish County Surface Water Management (SWM) conducted the most comprehensive look at wetlands within the watershed to date. SWM compiled wetland inventory data for the Quilceda-Allen Watershed Management Plan (Carroll &Thornburgh, 1998), from Snohomish County wetland inventory, from the National Wetland inventory and permit data within Marysville and Snohomish County. The functions and values and condition of wetlands were also assessed for a sampling of wetlands. A field study of 36 wetlands was completed, including an assessment of water quality function, flood attenuation, groundwater recharge (base flow support), and fish and wildlife habitat. The wetland inventory includes a wetland by wetland description,

[2] US Department of Army and US EPA Compensatory Mitigation Rules have changed the previous functions and "values" term to "services", meaning "benefits that human populations receive from functions that occur in ecosystems. (33 CFR Part 332.2)

and management recommendations. Wetland maps are in Appendix A, **Figure 8** - Figure 11**.**

A majority of wetlands had a moderate rating for flood attenuation and storm water abatement, with a very few wetlands rating high. Almost 60% of wetlands rated moderate for habitat values with approximately one third rating low, and 10% rating high for habitat values. A majority of wetlands rated in all Quilceda subwatersheds rated high for water quality services, with only a fifth rating low. (Carroll &Thornburgh, 1998)

The largest wetlands in the watershed are estuarine or stream adjacent, along Sturgeon Creek, the lower Quilceda, as well as large wetland areas associated with Edgecomb and Olaf Straad Creek. The West Fork Quilceda and Coho Creek subwatersheds also have large wetland areas (greater than 20 acres). The West Fork Quilceda and Edgecomb and Olaf Straad wetlands are in cleared agricultural areas, for the most part, and have potential for wetland rehabilitation by ditch removal and also for enhancement, by restoring them to shrub and forest cover.

The Tulalip Tribes have been conducting a wetland inventory of the Reservation, including the Coho Sturgeon and West Fork Quilceda watersheds. Over 440 acres of wetlands were determined by inventory in 2007-2009. This inventory is a detailed on-the-ground inventory, and shows a different result than previous wetland inventories for the site. In 1992, the Tulalip Tribes conducted a wetland inventory including wetlands in the Coho, Sturgeon and West Fork Quilceda watersheds and Quil Ceda Village boundaries. This inventory was based on hydric soil maps, and was not ground-truthed, due to the land area of Quil Ceda Village being under the Boeing lease at the time. This inventory appears to somewhat overestimate wetlands when compared to the current wetland inventory. Also, Snohomish County inventory for the Quilceda/Allen Watershed Management Plan was performed without having access to the property, and appears to greatly underestimate wetlands within the Quil Ceda Village area. A notable exception is the large wetland(> 30 acres) at the north end of Quil Ceda Village, which was also shown in the Drainage Needs Report. This wetland has been impacted by clearing of forest in the 1990's; however has returned to a forest condition since. The 2007-2009 inventory has revealed other similarly large or larger wetlands within the Quil Ceda Village boundaries west of 27th Ave NE. These wetlands have been dissected by a system of roads and deep ditches, but are primarily in an early seral forest condition. See **Figure 7** for a map of current inventory.

Due to the sandy soils onsite, prevalence of facultative vegetation, and lack of prolonged hydrology, the wetland inventory was aided by installation of shallow water table monitoring wells across the site. Monitoring wells were installed at the east and south boundaries of the Quil Ceda Village west of 27th Ave NE during the Tulalip wetland inventory in 2007 and 2008 (See Figure 2). The monitoring wells were installed to 33 inches in depth. Additional wells were installed in late winter of 2008-2009, with the majority being 15 inches in depth. Water table data showed depths dropped below well depths starting in early May through November. The water table also shows rapid response to rain events, with the water table close to the surface or ponded in both

wetland and upland wells in response to rain events, from December through late April. In addition, data shows that for wetlands within Coho Creek and Sturgeon Creek headwaters, the period of hydrology meeting wetland criteria is very short. The water table is only present above 12 inches between February and May of the growing season, usually dropping rapidly to below twenty inches by the end of May. (Tulalip Tribes, 2008a) Similar rapid water table fluxuation has been noted in portions of the West Fork Quilceda subwatershed, but it is unknown how widespread this condition is within the Quilceda watershed as a whole Location of monitoring wells is in **Figure 4**; well data from some of the wells is below.

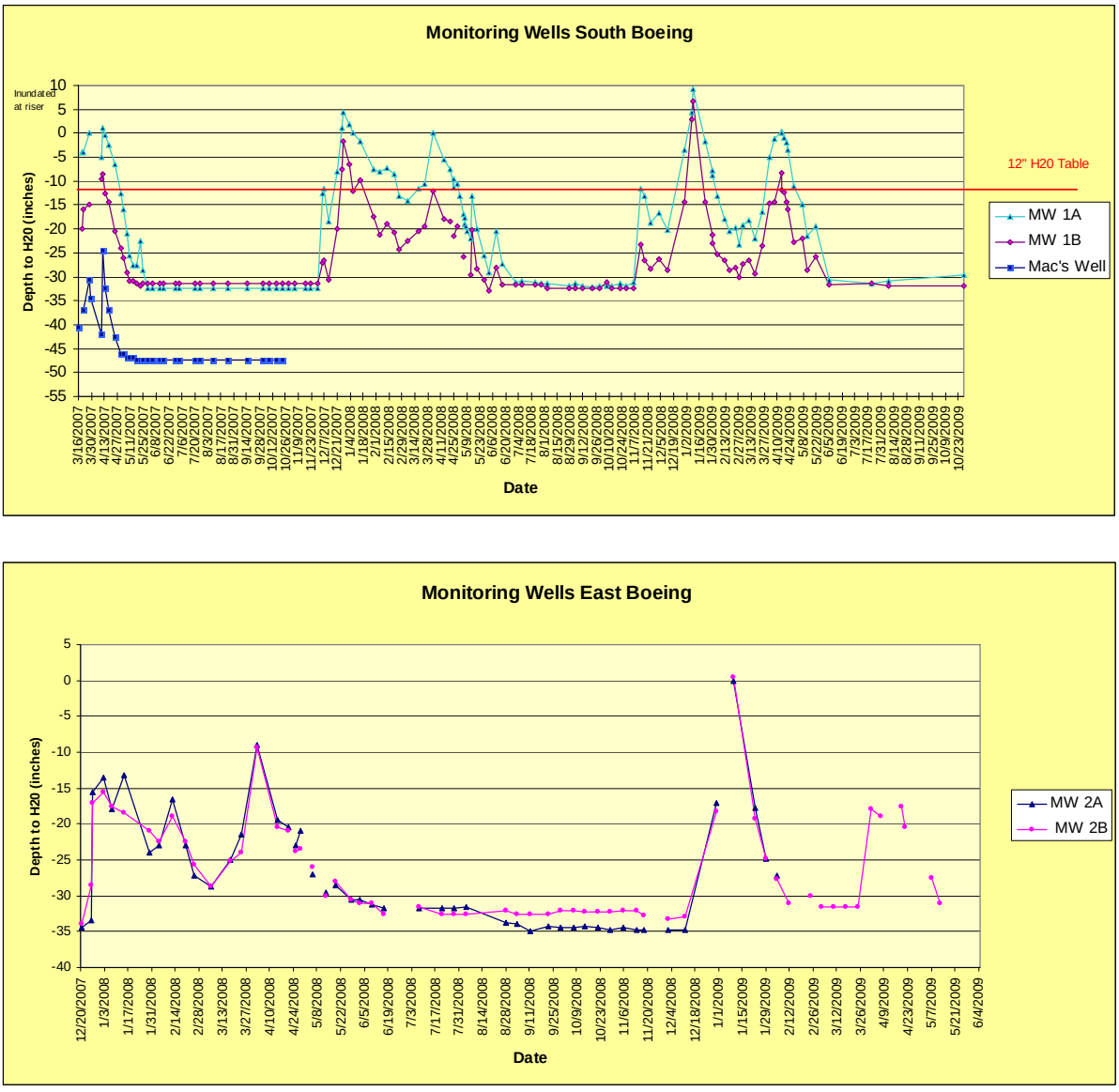


Figure 3: Monitoring Well Data in Quil Ceda Village, 2007 and 2008 Water Years[3]

[3] Monitoring Well 1A is a wetland well, with Monitoring well 1B, 2A, and 2B upland wells. Monitoring well 2A was considered redundant and decommissioned in 2009.

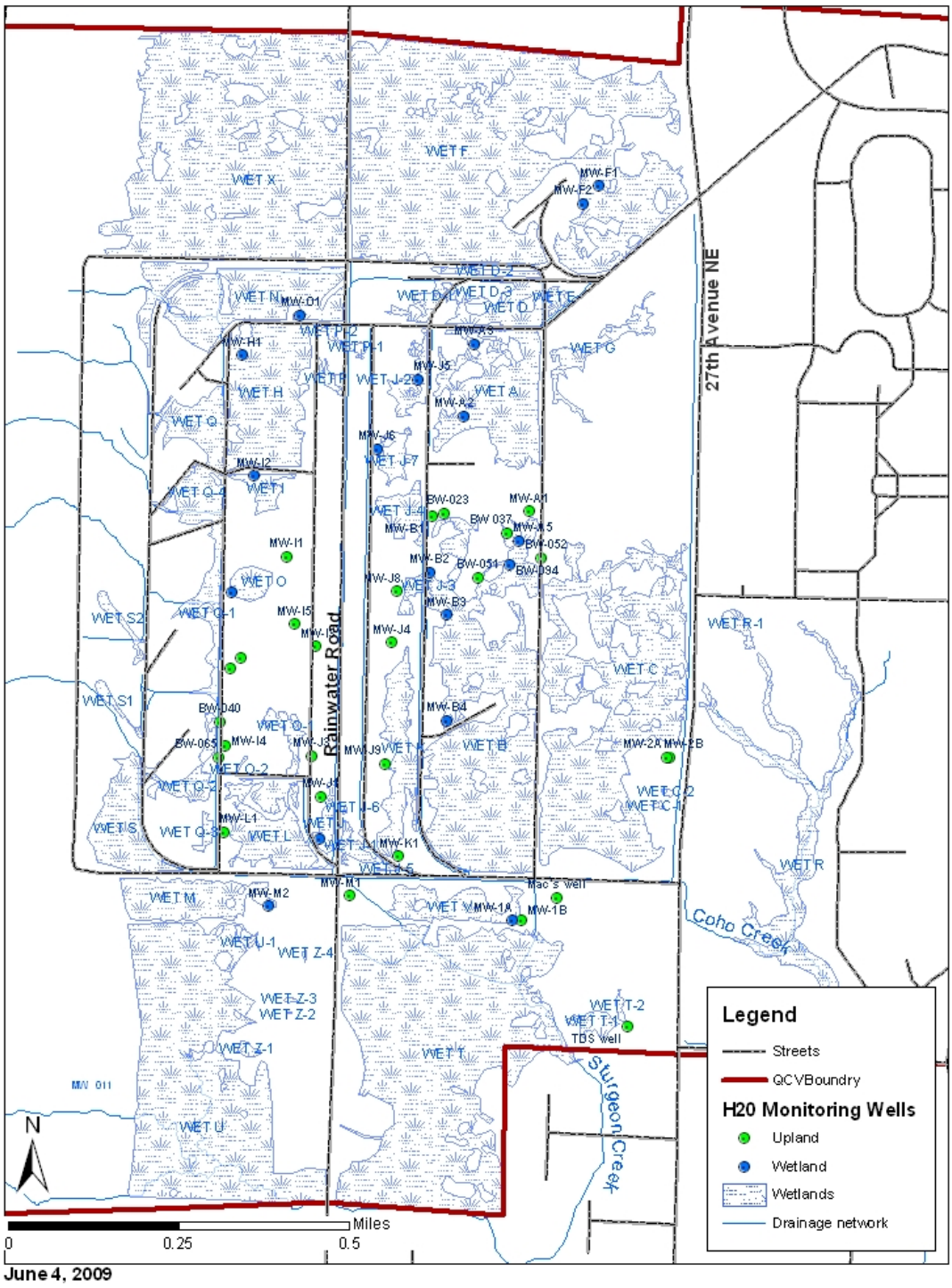


Figure 4: Location of Water Table Monitoring Wells in Quil Ceda Village

Wildlife habitat

Since the funding and focus of previous watershed plans has been connected to salmonid habitat and flooding issues, no assessment of wildlife habitat needs or existing condition within the watershed has been made by any plans or studies. However, the importance of wetlands in providing feeding, rearing, and resting habitat for a variety of species including invertebrates, amphibians, birds, and mammals was noted within the Drainage Needs Report. Numerous wetlands of exceptional habitat value were noted in the Quilceda-Allen WMP wetland study.

The Quilceda-Allen WMP noted that of wildlife species in Washington State, 75 percent use wetlands or riparian habitat during some portion of their life cycle. Many species occur only in wetlands. Species noted to use riparian habitat along Quilceda and Allen Creeks are raccoon, opossum, coyote, bald eagle, winter wren, Swainson's thrush, Stellar's jay, western garter snake and Pacific tree frog. Undoubtedly neo-tropical migrant bird species and numerous birds of prey should be included in this list. Forest fragmentation has reduced wildlife populations; however most Northwest forest inhabiting species with the exception of black bear and cougar are likely still found within the watershed.

Within the Tulalip reservation, bald eagle, black bear, cougar, coyote, birds of prey and numerous neo-tropical migrant bird species utilize both wetlands and forested areas. It is important to note several riparian and forest nesting birds are in decline in Washington State that may utilize the area (Audubon State of the Bird report 2007). In addition, Great Blue Heron have established rookeries on tribal property in the past, west of I-5, and could utilize areas within the Coho and Sturgeon Creek watersheds due to their forested condition and also proximity to the estuary. It is likely the forested interior block of the Reservation, with its numerous wetlands, bogs, and stream corridors, is a reserve of wildlife and plant diversity for the western portion of the Marysville trough.

A conclusion of the wetland inventory for Quil Ceda Village is that the wetlands, other than those providing a unique habitat of mature deciduous black cottonwood stands, contain ubiquitous facultative species and do not on the whole provide a great diversity of wetland species or obligate species, likely due to the lack of prolonged saturation or inundation. Forest practices have created areas of young forest, which lack diversity; and scrub shrub habitat and open water areas are lacking. However the site is a large area of wetland deciduous forest habitat of varying stand ages, including areas of 80 year old black cottonwood, and patches of older coniferous forest, which is connected by forested slopes on the western boundary of the Marysville trough to forestry zoned parcels in the interior of the Tulalip Reservation.

Water Quality

Water temperatures for Quilceda Creek reported in the WRIA 7 Salmonid Habitat Limiting Factors Analysis (WSCC, 2002) ranged between 12.0 and 13.7° C, and are noted within the range of "properly functioning." Quilceda Creek is listed as impaired on the State of Washington 1998 303d list for pH, dissolved oxygen, and fecal coliform.

Dissolved oxygen levels are attributed to elevated nitrate, nitrite, and phosphorus nutrients in stream sampled (SWM, 2002). Fecal coliform and nutrient problems are attributed to agriculture and septic systems upstream. No water quality data is available at time of writing for Coho Creek or Sturgeon Creek.

Both the City of Marysville and the Tulalip Tribes have been collecting data on streams within the Quilceda watershed. In addition, the Snohomish Conservation District also collected data for a livestock water quality improvements grant within the West Fork Quilceda Creek in 2004 and 2005. All monitoring data show low dissolved oxygen and high fecal coliforms consistently a problem throughout the watershed. Water temperatures are properly functioning throughout the watershed. Within the West Fork, the exception is the outlet to Nina Lake, a man-made lake just north of 140th St. NE which has water temperatures in excess of 25^{o} C during the dry season months of July and August (Snohomish Conservation District, 2006) (Tulalip Tribes, 2008)(City of Marysville, 2008). (See **Figure 19 and Figure 20, Appendix A**)

Water Quantity

The high groundwater table in the Quilceda basin is a unique contributor to streamflow and stormwater discharges in the watershed. In general, infiltration of precipitation and aquifer recharge is greater than aquifer discharge to the stream in the *northern* portion of the watershed, and discharge to the stream is greater than aquifer recharge in the southern portion of the watershed. Between 40 - 60% of streamflow is from groundwater discharge, on average, throughout the watershed (SWM, 2002). Any development that decreases groundwater recharge or storage capacity of the aquifer will decrease the flow in Quilceda Creek, especially during periods of no rainfall and lowest flows. Increased stream peak flows can also result from additional stormwater and rapid recharge through the sandy outwash soils. Sturgeon and Coho Creeks discharge to Quil Ceda Creek in its lower, tidally influenced reaches. It is unclear what effect reducing freshwater flows into the tidally influenced channel could have.

Analysis of Historic and Current Aquatic Resource Loss

The Quilceda-Allen Watershed Management Plan (Carroll, 1999) (Snohomish County PW, 1998), and the Tulalip Watershed Management Plan (Tulalip Tribes, 1996) provide a historical overview of the condition of the watershed. The WRIA 7 Salmonid Habitat Limiting Factors Analysis also details historic and current conditions limiting fish production within the Quilceda Creek watershed (WSCC, 2002). The Quilceda Drainage Needs Report (SWM, 2002) provides the most up to date compilation of resource conditions and in-depth monitoring of the watershed. In addition, water quality monitoring and stream monitoring have been conducted by Adopt a Stream, City of Marysville, The Tulalip Tribes, Snohomish Conservation District. Generally the City of Marysville has focused east of I-5 in the Quilceda, Edgecomb and Middle Fork Quilceda Creeks, with The Tulalip Tribes, Adopt a Stream, and the Snohomish Conservation District focusing in the West Fork Quilceda Creek.

Wetland Loss

Based on the extent of hydric soils mapped in the Quilceda watershed, Snohomish County Surface Water Management estimates that 75-85% of wetlands have been lost within the watershed. This number matches similar estimates in the Snohomish watershed as a whole, as well as Puget Sound as a whole (Carroll, 1999). Loss of wetlands may be one of the primary reasons for increased peak flows evidenced in the watershed. Within Tulalip Reservation lands, however, wetland loss is much less, due to lack of development. Within Quilceda Village boundaries, wetlands were impacted by ditching and fragmentation by roading under the Boeing lease and US Department of Defense use of the property. Within the West Fork Quilceda Watershed, wetlands and streams also have been ditched and wetlands have been degraded by conversion to farm lands. However, until recent Quil Ceda Village and Smokey Point developments, fill and impervious surface have not been a major factor in the West Fork sub-watershed, to a large degree due to the maintenance of properties in a rural pasture and hobby farm condition. As a result, wetlands persist in this area; however in a degraded state.

Fish Habitat/Channel condition

Snohomish County Surface Water Management (SWM) surveys conducted in 1993 noted agricultural impacts in upper Quilceda Creek. The highest sediment loads were at water quality stations in both the upper Quilceda and MF Quilceda Creek. The source of sediment in MF Quilceda included streambank erosion associated with a gravel mining operation, and agricultural activities. The WF Quilceda Creek had low total suspended solids, with the primary sediment sources reported as agricultural activities and ditching, and a dirt bike track near 116th St NE. Turbidity was not evaluated systematically among water quality issues in the more recent Drainage Needs Report; however the report notes that the lower and middle watershed does have ongoing problems (SWM, 2002). As

noted above, large woody debris, pool frequency and quality were reported as "not properly functioning" in the 2002 Report.

A dike just downstream of the confluence with Sturgeon Creek is impeding estuarine function from approximately 2 acres (WSCC, 2002).

Channelization and ditching

One of the major impacts of agricultural and sprawling suburban residential development has been ditching of stream channels and wetlands. Historically the upper watershed within the Marysville Trough was comprised of a large wetland complex (Snohomish County PW, 2002). Most of the wetland areas were drained by an extensive system of ditches within the upper valley, and the streams in the upper watershed, Edgecomb, West Fork, and Olaf Straad Creek were channelized around farm fields. This may be the other main reason for increased peak flows in the watershed. Channelization also removes in-stream habitat by increasing streambank scour, removing woody debris, riparian cover and natural pool riffle ratios found in meandering stream channels(Carroll, 1999) (WSCC, 2002).

Within the Coho and Sturgeon Creek headwaters on the Tulalip reservation, extensive roading and associated ditching through larger wetland areas have aggravated the water table fluctuations for these two creeks, draining wetland areas, with a rapid drop in groundwater table in the spring (Boyer, 2008).

Water Quantity-Groundwater recharge/Peak flows

Current peak streamflows in the Quilceda/Allen watershed have increased by an average of 40% from pre-development streamflow (Carroll, 1999). Flooding is a significant problem in the watershed due to the failure of ditch systems and the high groundwater table, which is close or at the surface during winter and spring months (WSCC, 2002). As discussed in earlier sections of this report, groundwater discharge is an important contributor to streamflow in Quilceda Creek in the lower watershed. There is no indication of previous losses in groundwater recharge in the watershed. Most impervious surfaces are in highly developed areas of Marysville and its Urban Growth Area (UGA), in residential and commercial areas within the Middle Fork and Mainstem lower watersheds. Undoubtedly surface water storage has been reduced historically within these areas.

The WRIA 7 Limiting Factors Analysis noted that the high water table throughout the Marysville trough is the main reason for all the ditching within agricultural areas. In addition the high water table makes stormwater detention ponds difficult to construct as the watershed develops.

Water Quality

Water Quality data in the service area has been collected by The Tulalip Tribes, Snohomish County SWM, City of Marysville, and Snohomish Conservation District. Water Quality data collection has focused on the West Fork Quilceda Creek and Edgecomb, Hayho and the Middle Fork and Mainstem Quilceda Creek. Fecal coliforms, low dissolved oxygen and elevated stream temperatures have been identified associated to agricultural and residential parcels within the West Fork Quilceda and also Middle Fork and mainstem Quilceda. Overall, the Quilceda has high levels of nutrients (nitrate, nitrate-nitrogen and phosphorus) are regularly detected in the Quilceda (SWM, 2002) (WSCC, 2001). Nutrient levels are often associated with algal production and contribute to low dissolved oxygen levels (SWM, 2002). (See **Figure 19 and Figure 20, Appendix A**)

West Fork Quilceda Creek

Snohomish County Surface Water Management found an increase in fecal coliform concentrations in the West Fork Quilceda Creek at 128th St NE between 1994 to 2002. This trend continues in the monitoring conducted by both the Snohomish Conservation district and Tulalip Tribes Natural Resource Department.

The Snohomish Conservation District conducted water quality monitoring within the WF Quilceda as part of a DOE funded Quilceda Allen Watershed Livestock Water Quality Improvement project. The wet season water quality monitoring took place in November and December 2004, and dry season monitoring took place in August and September 2005. Data were collected at eight monitoring points in tributaries to Quilceda upstream of 128th St NE.

Fecal coliform, temperature, and dissolved oxygen were all outside of DOE state standards in both Tulalip water quality monitoring data and in the Snohomish Conservation District data for the West Fork Quilceda Creek. Highest temperature readings were at the outlet to Nina Lakes.

Mainstem Quilceda Creek

The City of Marysville has collected water quality data between 2006 to present. Three sites on the mainstem Quilceda have been monitored, as well as at the confluence of Hayho Creek with the mainstem.

Fecal coliform has been elevated at all sampling sites, with low dissolved oxygen also at Hayho Creek. Stream temperature, turbidity, and pH have been mostly within the acceptable range. Hayho Creek had high turbidity in July and August of 2007, low rainfall months, indicating it was likely associated to improper erosion control during construction or ditch cleaning within this watershed (City of Marysville, 2008).

Riparian Cover

Historically, riparian cover and buffers to wetlands have been reduced in conversion of lands to agriculture. In residential areas within Marysville City limits, riparian areas

were maintained to a greater extent on mainstem areas, however there is lack a forested cover in approximately 50% of surveyed stream reaches (Carroll, 1999) (WSCC, 2001).

Generally riparian cover is maintained in the same condition as previously noted in the Tulalip Watershed Plan and the Quilceda-Allen Watershed Management Plan. Numerous riparian planting projects have been undertaken by the City of Marysville, Snohomish County, Snohomish Conservation District, Adopt-a-Stream, and the City of Arlington, on City of Marysville properties, and in cooperation with private landholders (See Watershed Characterization) (Cara Ianni, pers. comm., 2008). Riparian fencing on agricultural lands and riparian planting projects have occurred in Edgecomb Creek, Middle Fork Quilceda, and West Fork Quilceda sub-watersheds. These projects are still relatively young (less than a decade old) and will not mature for several decades to the extent of impacting stream habitat.

Threats to Aquatic Resources

Comprehensive watershed information gathered by the Tulalip Watershed Plan and the Quilceda-Allen Watershed Management Plan included: water quality reports prepared by Snohomish County and Tulalip Tribes, spawner data from WDFW and the Tulalip Tribes, studies collected on the Snohomish River delta, geologic maps, ground water reports, watershed well logs, stream flow monitoring, fish habitat assessment, and stormwater runoff models. The Salmonid Habitat Limiting Factors Analysis for the Snohomish basin, undertaken in cooperation with numerous agencies and The Tulalip Tribes (WSCC, 2002) and the Quilceda Drainage Needs Report (SWM, 2002) also used to update information in earlier plans for this planning effort.

The following list of threats is developed from the Tulalip Watershed Plan and the Quilceda-Allen Watershed Management plan and confirmed by members of the Allen Quilceda Watershed Action Team for this planning framework (added threats are in italics):

- **Hydrologic impacts of Basin urbanization/impervious surface**
  - Increased peak runoff rates, stream scour and bank erosion
  - Reduced ground water recharge
  - Diminished summer base flows

- **Water Quality Impacts**
  - High levels of bacteria and nutrients due to failing septics, livestock and pet waste
  - Reduced dissolved oxygen, increased algal blooms, increased juvenile fish mortality
  - Increased pollutants in urban runoff: petroleum and metal toxicity, *endocrine blockers*

- **Physical habitat, buffers, interconnected habitat**
  - *Inadequate buffers on tributaries, and ditched portions of streams*
  - *Inadequate recruitment potential for LWD*
  - *Loss of structural, instream pool forming factors such as LWD*
  - Decreased bottom habitat, siltation of spawning gravels
  - Stream channelization (ditching and straightening)
  - *Threats to cultural species, collection sites (Tulalips)*
  - Loss of migration corridors.
  - *Creation of isolated non-viable wildlife populations, migratory songbird, amphibian, plant populations*
  - *Loss of food webs*

The potential for channel changes occurring as a result of increased stormwater is a primary area of concern, due to the threat of urbanization and development within the Quilceda Watershed, and particularly the City of Marysville UGA. Informal surveys with property owners in the West Fork Quilceda have indicated development on the Tulalip plateau may have increased stormwater impacts in the Trough area. Within the mainstem Quilceda inner gorge, the stream response to increased flows and flooding could cause landslides within the valley walls, which are comprised of highly erodible sandy sediments. Channelized streams and ditches within wetlands exacerbate stormwater problems by increasing flood flow velocities.

Wetland loss also threatens food webs and cultural species important to the Tulalip Tribes. Creation of isolated sub-populations of plant and animal species is a threat when habitat corridors between wetland, streams, and forested habitats are broken. While many species of birds and mammals may be able to migrate across barriers of pavement and buildings, some species such as amphibians have short mobility and are unable to migrate longer distances between vegetation patches, or may be more subject to predation.

Aquatic Resource Goals and Objectives for the Service Area

The following Goals for the Quilceda Watershed are adapted from the Tulalip Watershed Plan, and have been updated by scoping with members of the Allen-Quilceda Watershed Action team, in a meeting on October 3, 2008. Participating agencies/groups were: the Tulalip Tribes Natural Resources Department, Snohomish County, City of Marysville, City of Arlington, Snohomish Conservation District, Adopt-a-Stream, and the Stilly-Snohomish Salmon-Enhancement Task Force (SSSETF). The Goals have been ordered in order of priority to the In-lieu fee Program.

- **MAINTAIN HYDROLOGIC FUNCTION**
  - Maintain/restore groundwater recharge
  - Headwater storage, delivery
  - Maintain groundwater recharge
  - Prevent groundwater contamination
  - Maintain/restore floodplain connectivity (floodwater storage, flood attenuation)

- **NO NET LOSS, LONG TERM NET GAIN IN WETLAND FUNCTION AND ACREAGE**
  - Restore degraded wetlands
  - Identify opportunities for wetland establishment
  - Reconnect wetlands to stream corridors
  - Preserve wetland and stream corridors through acquisition

- **PROTECT/RESTORE QUALITY OF SURFACE WATERS**
  - Reduce urban and rural point and non-point runoff pollution
  - Reduce unnatural sediment input into streams to levels than can be transported out of the system by stream flow at all times of the year.
  - Restrict livestock access to streams
  - Remove ditching in wetlands and streams

- **MAINTAIN AND IMPROVE FISH SPAWNING AND REARING HABITAT**
  - Maintain hydrologic function as further developments occur
  - Maintain headwater storage, delivery
  - Restore/maintain floodplain connectivity (floodwater storage, flood attenuation)
  - Maintain habitat corridors, hydrologic connectivity
  - Revegetate stream corridors
  - Restore natural meanders in West fork Quilceda Creek
  - Restore in-channel complexity and habitat features

As a summary of the discussions on watershed needs and priorities, the key points are as follows:

Wetland creation, re-habilitation or enhancement can create additional flood storage needed as the watershed continues to develop. Wetland restoration potential is high within the West Fork Quilceda, Edgecomb and Olaf Straad Creek subwatersheds, due to conversion of wetlands to agricultural uses and the potential for ditch removal to restore wetlands. Restoration projects that involve filling in or blocking ditches, and restoring stream meanders, as well as re-establishment of forest and shrub cover will restore native species sinks and have the potential to increase water storage and reduce flooding. The City of Marysville and City of Arlington have identified potential restoration projects within the Edgecomb and Olaf Straad subwatersheds, and have been actively working on developing a mitigation plan there. Snohomish County efforts have been focused on streamside habitat improvements in the Middle Fork and lower mainstem Quilceda Creek, as well as on culvert replacement projects to restore fish passage and correct flooding problems. Wetland preservation is also seen by the group as an important strategy in stormwater management.

Stream buffer restoration on both ditched streams or logged streamside areas for habitat creation and water quality protection, as well as wetland creation in association with streams for creation of flood storage are primary categories with high restoration potential. Potential mitigation project sites are identified on **Figure 12 --** Figure 14, **Appendix A**.

Prioritization Strategy for Selecting Compensatory Mitigation Activities

Both the Quilceda/Allen Watershed Management Plan and the WRIA 7 Limiting Factors Analysis indicated priorities for restoration actions within the Quilceda Watershed. Many of the restoration activities are focused on salmonid habitat and population needs. The Quilceda-Allen Watershed Management Plan also has a wetland study with wetland specific management actions identified by sub-basin. The AQWA Team members, convened in October, 2008, agreed with the priorities identified in these previous planning documents, updated the priorities with a concern for wetland mitigation, and identified potential project areas/sites. Potential restoration activities that could serve as in kind or out of kind mitigation for wetland impacts are summarized in order of priority below[4]:

Coho and Sturgeon Creek Planning Area

1. Preservation of Coho and Sturgeon Creeks and their riparian buffer areas.
2. Road removal within Quil Ceda Village property west of 27th within stream buffer and wetland areas.
3. Creation and rehabilitation of riparian wetlands.
4. Wetland rehabilitation via restoring wetland hydrology, ditch removal, culvert removals, fill removal, etc.
5. Restoration of stream reaches within Sturgeon and Coho Creeks, for example ditched stream reaches restored to meandering channels,
6. Preservation of forest headwaters to create a wildlife corridor and buffer connected to forest parcels on the Tulalip plateau.
7. Acquisition and preservation of riparian wetlands on Coho and Sturgeon Creek.
8. Wetland enhancement by invasive species removal and conifer underplantings within wetland areas.
9. Enhancement of impacted stream and wetland buffers by planting shrubs and trees.

See Figure 12, Appendix A.

West Fork Quilceda Planning Area

1. Wetland rehabilitation via restoring wetland hydrology, ditch removal, culvert removals, fill removal, etc. For example: ditch removal (floodplain reconnection)

[4] The areas shown on maps are for the purposes of documenting restoration potential in the watershed, but are not exclusive of other potential projects that may be identified and meet the proposal criteria, or fall into categories identified in this section.

in parcels that have ditched wetland areas connected to West Fork Quilceda Creek.
2. Acquisition and rehabilitation of wetland areas adjacent to WF Quilceda Creek and its tributaries.
3. Wetland enhancement by re-vegetation of wetlands and wetland buffers with trees and shrubs.
4. Acquisition and preservation of two wetland areas, a bog wetland and large forested wetland, adjacent to the WF Quilceda. These wetlands are noted as WF-36 and WF-20 in the Quilceda/Allen WMP. One of these, WF-20 is located outside of Reservation boundaries.
5. Wetland creation where opportunities exist to create flood storage associated to WF Quilceda Creek
6. Restoration of riparian buffer on ditched watercourses on where vegetation is absent.
7. Restoration of riparian buffer on streams where vegetation is absent.

See Figure 13, Figure 15 Appendix A.

Mainstem Quilceda Planning Area

1. Acquisition, preservation and enhancement of forested and headwater wetlands identified in the Quilceda/Allen WMP and Drainage Needs Report (Wetlands 50, 51, 52, 53, Figure 11, Appendix A).
2. Permanent protection of the large estuarine wetland at the mouth of Quilceda Creek (MQ-13 in the Quilceda/Allen WMP).
3. Restore floodplain, wetland, and riparian function in channelized areas in the watershed.
4. Wetland and stream bank buffer enhancements, restoring riparian buffers on the mainstem channel.
5. Increase habitat diversity in areas with limited LWD presence and near-term recruitment potential, with particular attention to agricultural areas.

See Figure 12, Appendix A.

Edgecomb Creek Planning Area

1. Wetland and wetland buffer restoration via restoring wetland hydrology, ditch removal, fill removal, etc. Ditch removal (floodplain reconnection) in parcels that have ditched wetland areas connected to EdgecombCreek.
2. Wetland creation adjacent to stream areas.
3. Wetland rehabilitation by re-vegetation of wetlands with trees and shrubs.
4. Restoration of riparian buffer on ditched watercourses on where vegetation is absent.

The City of Marysville is working on a regional plan for wetland preservation and restoration in this watershed. Wetland proposals should be coordinated with the City of Marysville. (See **Figure 14, Appendix A**)

Middle Fork Quilceda Planning Area

1. Restoration of riparian buffer streams in logged areas and where vegetation is absent.
2. Projects to improve channel complexity and fish habitat.
3. Preserve headwater and riparian wetlands.

The City of Marysville and Snohomish County have been working primarily on culvert replacements to improve fish passage as well as riparian buffer enhancements.

Site Selection (33 CFR 332.3(d)

1. **Preference will be given in selection of projects to those proposed in the following areas, listed in order of preference:**

    - the Sturgeon and Coho Creek subwatersheds,
    - the Tulalip Reservation Boundaries and the West Fork Quilceda watershed,
    - the West Fork Quilceda subwatershed outside of Reservation Boundaries.

    Because the anticipated project impact areas are within Coho and Sturgeon Creek, and within Quilceda Village boundaries, those subwatersheds will be first priority for mitigation projects. Because of the proximity and hydrologic connection of the West Fork Quilceda to the expected project impact areas within Quil Ceda Village, new wetland creation, rehabilitation and enhancement within the West Fork Quilceda in closest proximity to the project will have the greatest ecological connection to replace lost functions and services within the impact area, after priority projects are accomplished in the Sturgeon and Coho Creek subwatersheds.

2. **The order of preference to resource type of mitigation projects shall be:**

    - Wetland re-establishment
    - Wetland creation, rehabilitation, and enhancement
    - Acquisition and preservation of wetland or wetland buffer parcels that are at risk of development, and provide flood storage benefits or wildlife habitat or native species habitat.
    - Preservation of Tribally-owned parcels that are at risk of development, that provide headwater delivery or wildlife habitat or native species habitat.
    - Restoration of stream hydrologic or habitat function such as restoring stream meanders and channel complexity.

- Riparian enhancement to reduce stream temperatures, increase dissolved oxygen and reduce fecal coliforms by filtering pollutants
- Culvert replacements for fish passage or hydrologic attentuation when there is a wetland restoration or enhancement component to the project, except where mitigation credits are purchased for impacts to stream resources

Site selection for mitigation activities will consider the ecological suitability of the compensatory mitigation site to providing aquatic resource functions that adequately mitigate the functions lost with permitted activities. For example, impacts within the Sturgeon Creek subwatershed that affect flood storage should be mitigated with actions that replace the lost functions and services within that subwatershed. However habitat loss impacts may be mitigated at a larger landscape scale. Due to similarities in the Quilceda watershed, mitigation may be suitable within any of the subwatersheds, with an emphasis on replacing functions and services within closest proximity to impacts. In addition, mitigation should adequately compensate for lost functions and services, such that wetlands are replaced at an equal or greater category or functional state by mitigation actions. Due to threats of urbanization within the watershed, preservation of wetland areas of significant hydrologic, species or habitats may be considered a good fit to replace habitat losses, when combined with restoration of wetlands within the subwatershed, to achieve goals of ecosystem sustainability at a watershed scale.

Due to the importance of maintaining groundwater recharge to Quilceda Creek, and the poor ability of the watershed to store stormwater due to a high water table, wetland creation, rehabilitation and acquisition are important tools toward maintaining and enhancing flood storage in the watershed. The following is a summary of important hydrologic, biologic and habitat conditions in the watershed that may influence choice of restoration sites or activities:

3. **Hydrological conditions, and other physical and chemical characteristics (33 CFR 332.3(d)**

All of the Quilceda subwatersheds have similar hydrologic and physical and chemical characteristics related to aquatic resources. The project impact areas within Quil Ceda Village are within Coho and Sturgeon Creek, in close proximity to the West Fork Quilceda Creek, all of which flow through the valley bottom of the Marysville Trough and its sandy recessional outwash sediments. These three subwatersheds have their headwaters in the Tulalip plateau, but flow primarily within the valley bottom. Of the remaining subwatersheds in the Quilceda watershed basin, Edgecomb, and Olaf Straad Creek are most similar to Coho Creek, West Fork and Sturgeon Creek, comprised mainly in the Trough valley, with shorter reaches in the plateau areas. The Middle fork and Mainstem Quilceda Creeks have more stream length in the Getchell plateau, with more gravel spawning areas, and are larger channels with much wider bankful flow and stream valleys. These latter two subwatersheds also are more dominated by residential development, and have fewer

wetland restoration opportunities outside of the stream channel valleys. Coho Creek, Sturgeon Creek, and the West Fork flow into the mainstem in the lower watershed, and the Middle Fork and Edgecomb Creek join the Mainstem higher in the watershed. However, the effects on flow in Quilceda Creek are likely to be greatest from the Middle Fork, and upper Mainstem due to the fact that Coho, Sturgeon Creek, and the West Fork join the Mainstem in its tidally influence portion.

There is similarity also in riparian condition between Coho Creek, the West Fork Quilceda, and Edgecomb, and Olaf Straad Creeks in that all of these subwatershed areas have a lot of area converted to agriculture, with little riparian cover. They also have forested areas in the plateau sections of the streams feeding the valley areas. There are similarities found also in the water quality data between all of these streams in that fecal coliform is a primary concern, and dissolved oxygen is a concern in some areas; however stream water temperatures are generally cool. In all of the subwatersheds groundwater is the primary source to stream flow, with discharge to the Mainstem and Middle fork in the lower watershed. The overriding role of the geology of the basin to stormwater issues and to groundwater recharge in both wetlands and streams is similar throughout the watershed.

Wetland rehabilitation associated with stream restoration in the form of ditch removal and restoration of channel meanders is a valid activity in almost all of the subwatersheds, including Coho, West Fork, Olaf Straad, Edgecomb, and Hayho as well as Middle Fork Quilceda Creek.

4. **Watershed-scale features, such as aquatic habitat diversity, habitat connectivity (in accordance with 33 CFR 332.3(d))**

As a lowland watershed, the Quilceda has a unique suite of species adapted to its natural habitats, from those utilizing the marine areas at the mouth of the Quilceda, to the riparian areas and extensive wetland areas within the lowland. As parts of an urban watershed, with rapid growth in population, residential housing and development of commercial areas, the Quilceda subwatersheds have similar unique challenges and needs for restoration.

Habitat connectivity is greatest in Coho Creek, Sturgeon Creek and the Middle Fork and Mainstem Quilceda watershed areas, with most impacts to habitat connectivity in the agricultural areas of the West Fork and Edgecomb, Hayho, and Olaf Straad watersheds. The residential areas in the Middle Fork and Mainstem Quilceda have relatively good riparian corridors due to earlier buffers left with streams. There is good potential throughout the watershed for reconnecting wetland habitat with stream habitat and restoring greater habitat diversity (vertical and structural diversity such as larger trees and coniferous vegetation, and large woody debris and snags). Also there is good potential and need for restoring forest cover with wetlands and stream and their buffers. Preservation may be an important tool in maintaining habitat corridors to maintain biological and ecological integrity of the watershed.

5. **Compatibility with adjacent land uses and watershed management plans**
   Restoration goals and projects identified in the Tulalip Watershed Management Plan, WRIA & Limiting Factors Analysis, Drainage Needs Report, and Quilceda-Allen Watershed Management Plan are being incorporated into this Fee-in-Lieu Planning Framework above, and the documents are incorporated by reference herein.

   Site selection will consider compatibility of adjacent land uses, such vegetation conditions, disturbance, light, noise, and connectivity to other natural resource areas. For example, creation of a wetland adjacent to a large industrially-zoned parcel may not be considered as high priority as a proposal to enhance wetlands on a riparian corridor that connects to an adjacent native growth protection area, or forestry zoned parcel, due to the greater effect of restoring connectivity in the later example.

   One issue that may arise in West Fork Quilceda Creek is the zoning of lands to agriculture as a conflict to restoration of parcels where ditching has created agricultural lands.

6. **Reasonably foreseeable effects of the compensatory mitigation project**
   Site selection will also consider the reasonably foreseeable effects of the mitigation projects on ecologically important aquatic or terrestrial resources such as estuarine habitat, mature forests, needs of wildlife and endangered species within the subwatershed area. Functions and services and aquatic resource types must be mitigated at an equal or greater value than those impacted, and the in-lieu fee account needs to insure that aquatic resource types and functions and services are tracked separately.

   Expected effects of the mitigation projects as prioritized, over the long term, are greater flood attenuation, with more sustained summer low flows, and more moderate peak flows during winter storm periods. Some culvert replacement projects may themselves need accompanying flood storage capacity created, due to passage of greater flows as more adequately sized culverts are installed.

   Greater habitat connectivity is expected to contribute to more stable plant and wildlife populations and greater diversity and sustainability of the ecosystem as a whole, in its ability to withstand ecological disturbances such as climate change.

   Water quality is expected to be improved within mitigation areas, and in the long term, within West Fork Quilceda Creek and Coho Creek, an improving trend is expected, as more stream reaches are revegetated with forest and shrub cover. Greater wood recruitment potential is expected to lead to improved pool size and numbers of pools within mitigation project areas. Improved fish rearing habitat is also expected.

Preservation Objectives (in accordance with 332.3(h))[5]

Preservation of wetlands and riparian resources has been identified as an important need in the Quilceda Watershed by the Quilceda/Allen WMP, and the Tulalip WMP, as well as by the AQWA team members giving input to this planning framework. Due to the rapid urbanization and commercial development associated with Quil Ceda Village and with the Marysville UGA, and the I-5 corridor, and the importance of stormwater and groundwater to hydrologic modeling in the watershed, wetland preservation has been identified as an important stormwater management tool. In addition wetlands provide an important reservoir and refuge of plants and animals in the unique lowlands of the Marysville trough. Particularly when connected to riparian corridors, wetlands present a valuable ecological resource for the Quilceda Watershed.

Seven wetlands were recommended for permanent protection due to their size, exceptional habitat and plant heritage value, floodwater abatement and base flow support by the Quilceda/Allen Watershed Management Plan. Two wetlands were recommended for permanent protection in the West Fork Quilceda. A forested wetland at the headwaters of a tributary to the West Fork Quilceda within the Tulalip reservation boundaries was recommended for preservation. Within Sturgeon Creek watershed, a large (50 acre) wetland within the riparian corridor and associated to Sturgeon Creek was recommended for permanent protection and adequate buffering due to its exceptional habitat and flood attenuation values. The estuarine wetland at the mouth of Quilceda Creek, also within the Tulalip reservation, was also proposed for permanent protection via acquisition. This wetland is the largest wetland in the watershed (350 acres), and is listed as a DNR Heritage site. Additional wetlands have been added within the West Fork Quilceda subwatershed as a result of this planning process, in consultation with Tulalip Tribes and members of the Allen-Quilceda Watershed Action Team. Wetlands recommended for permanent protection are in **Figure 8** –**Figure 11**, **Appendix A**.

Criteria for using preservation as compensatory mitigation as given in 33 CFR 332.3(h) will be utilized for selecting preservation projects. The criteria are:

1. The resources to be preserved provide important physical, chemical, or biological functions for the watershed.
2. The resources to be preserved contribute significantly to the ecological sustainability of the watershed. In determining the contribution of those resources to the ecological sustainability of the watershed, the district engineer must use appropriate tools, where available;
3. Preservation is determined by the district engineer to be appropriate and practicable;

[5] Federal Register, Vol. 73, No. 70, Compensatory Mitigation for Losses of Aquatic Resources, Final Rule, US Department of Army, Corps of Engineers, 33 CFR Parts 325 and 332; Environmental Protection Agency 40 CFR Part 230, April 10, 2008

4. The resources are under the threat of destruction or adverse modifications; and
5. The preserved site will be permanently protected through an appropriate real estate or other legal instrument (e.g. easement, title transfer, or land trust).

Public and Private Stakeholder involvement in Plan development

This planning document compiles and updates planning processes involving public and private stakeholder involvement for the sub-watersheds of Coho Creek and Sturgeon Creek as well as the Quilceda Creek watershed as a whole. The Tulalip Watershed Plan, completed in 1996, involved local community members on a Tulalip Citizens Advisory Committee, as well as the Tulalip Hatchery Manager, Forestry Department, Tulalip Shellfish Biologist. The Quilceda/Allen Watershed Management Plan**,** completed in 1999, was put together by Snohomish County, and involved a Watershed Management Committee including The Tulalip Tribes, City of Marysville, Marysville--Pilchuck High School, Snohomish Conservation District, private citizens and farmers, the Snohomish Health District and City of Arlington, as well as the Environmental Protection Agency, the Washington Department of Ecology, Snohomish County Surface Water Management, Public Works and Planning and Development Services. In addition, this Planning Framework includes information provided in the WRIA 7 Salmonid Habitat Limiting Factors Analysis**,** undertaken by the Washington State Conservation Commission, with the cooperation of Tulalip Tribes, the Washington Department of Fish and Wildlife, Puget Sound Energy, Washington Trout, Snohomish County Surface Water Management, and National Marine Fisheries Service.

Public and Private stakeholder input was obtained to update the above mentioned plans through members of the **Allen-Quilceda Watershed Action Team**, and members of **The Tulalip Tribes** in a meeting held October 3, 2008. Organizations and agencies working within the watershed were invited to participate in the update of watershed goals and restoration needs for this Planning Framework. Participants were: Snohomish Conservation District, Stilly-Snohomish Salmon Enhancement Task Force, Tulalip Tribes Natural Resource Department, Snohomish County Surface Water Management, City of Marysville and City of Arlington.

Long term protection and management strategies for mitigation sites and activities

The Consolidated Borough of Quil Ceda (Quil Ceda Village) will require long term protection and management of mitigation sites, through restrictive covenants granted by the Tulalip Tribes, and through permit conditions. Project criteria will include provision of a long term protection and monitoring of mitigation projects funded by the in lieu fee program.

Periodic evaluation and reporting strategy

An Interagency Review Team (IRT) will be established with the Fee-in-Lieu program, in part for the purpose of monitoring the success of the Fee-in –lieu program in achieving goals and objectives of the Program. It is expected that some of the members of the IRT will be the same parties who contributed to this planning process. Annual reporting to the US Army Corps of Engineers (Corps) will be shared with the IRT, and a biannual report will also be prepared by Quil Ceda Village for the Corps and the IRT, to place the compensatory mitigation projects within the context of the goals and objectives outlined in this Planning Framework.

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Appendix A
Figures

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Quilceda Watershed and Streams

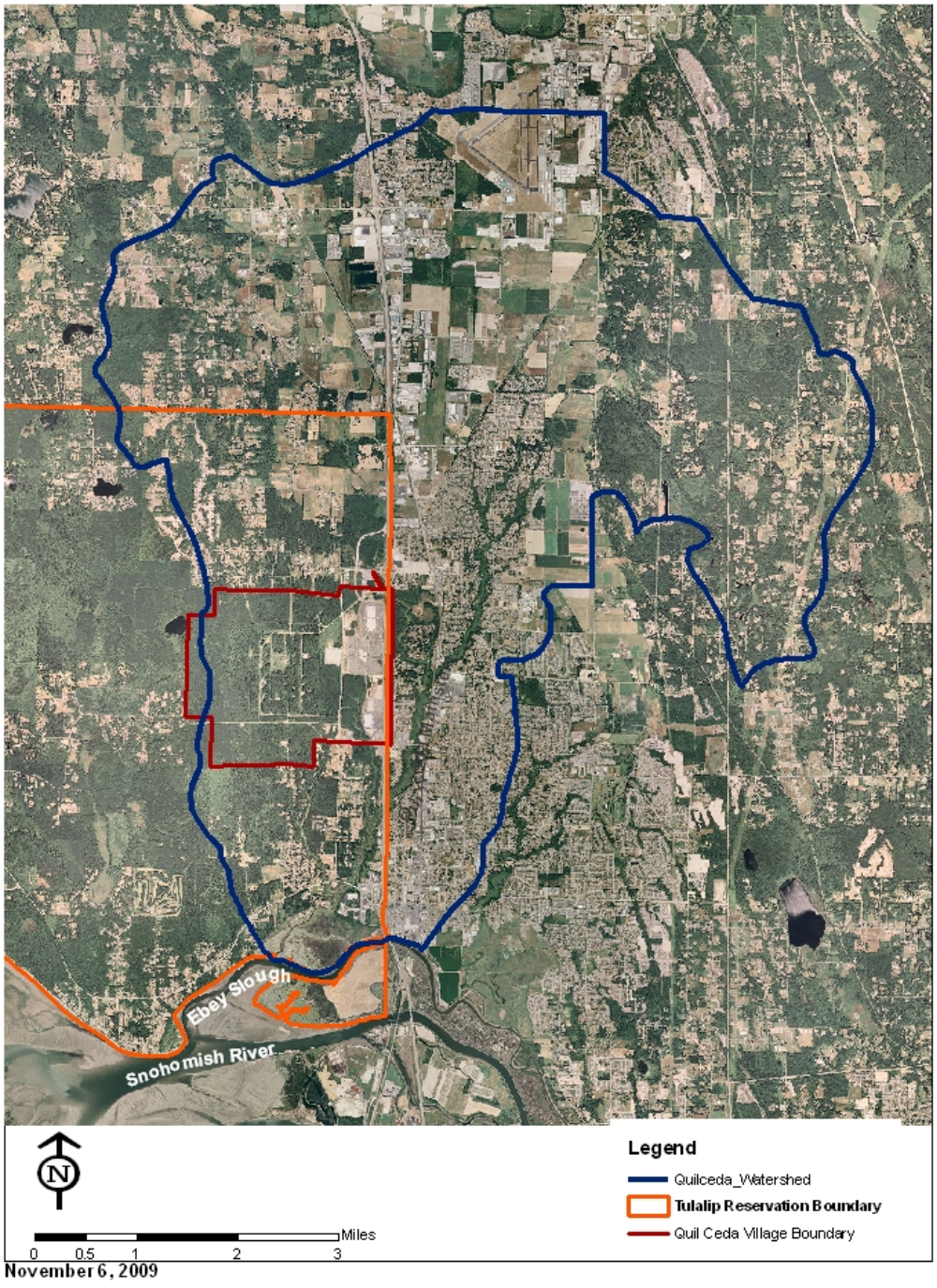

Figure 5: 2007Aerial Photograph of the Watershed

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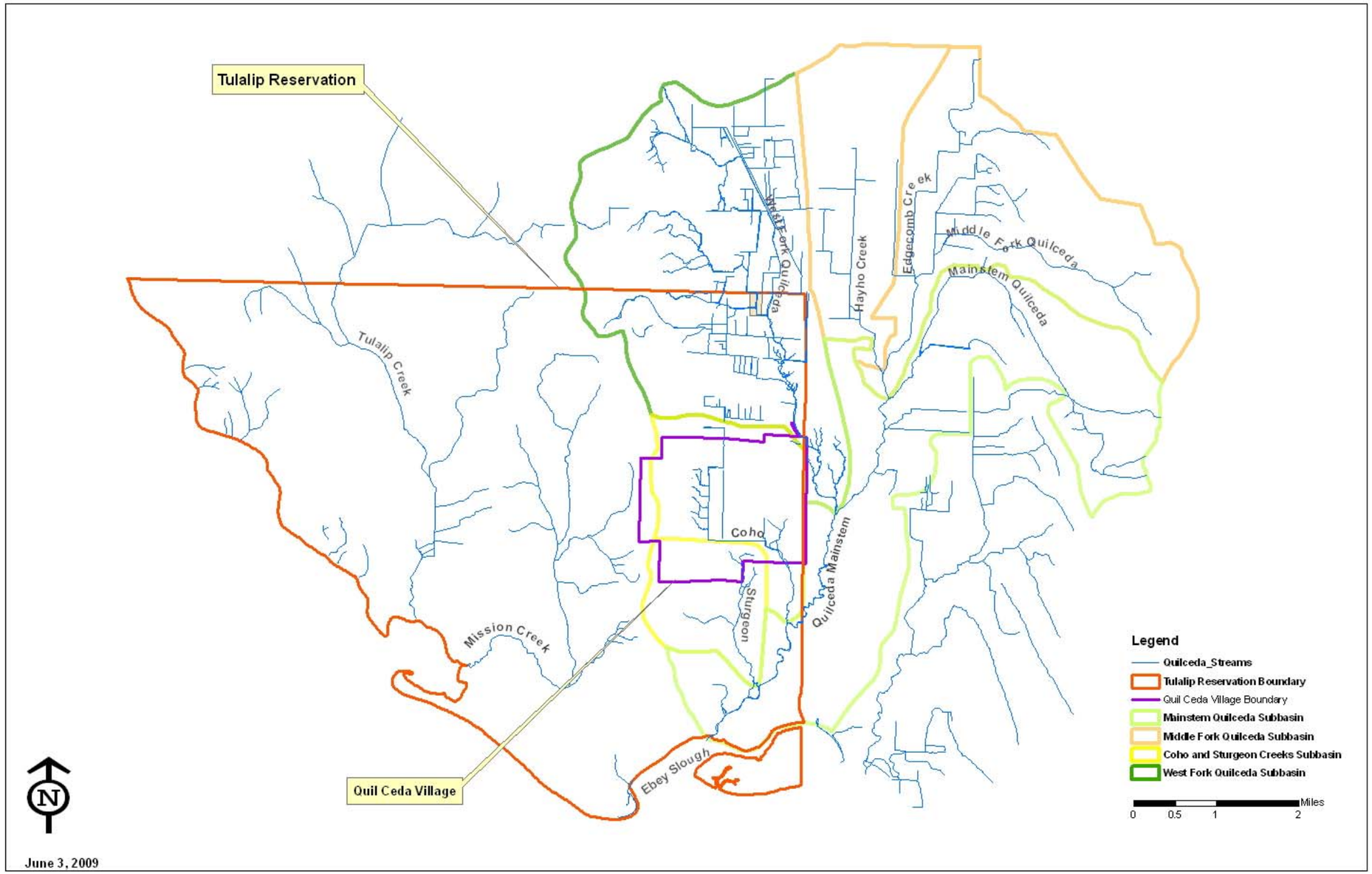

Figure 6: Stream Network of the Quilceda Watershed

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Wetlands Mapped in the QuilcedaWatershed

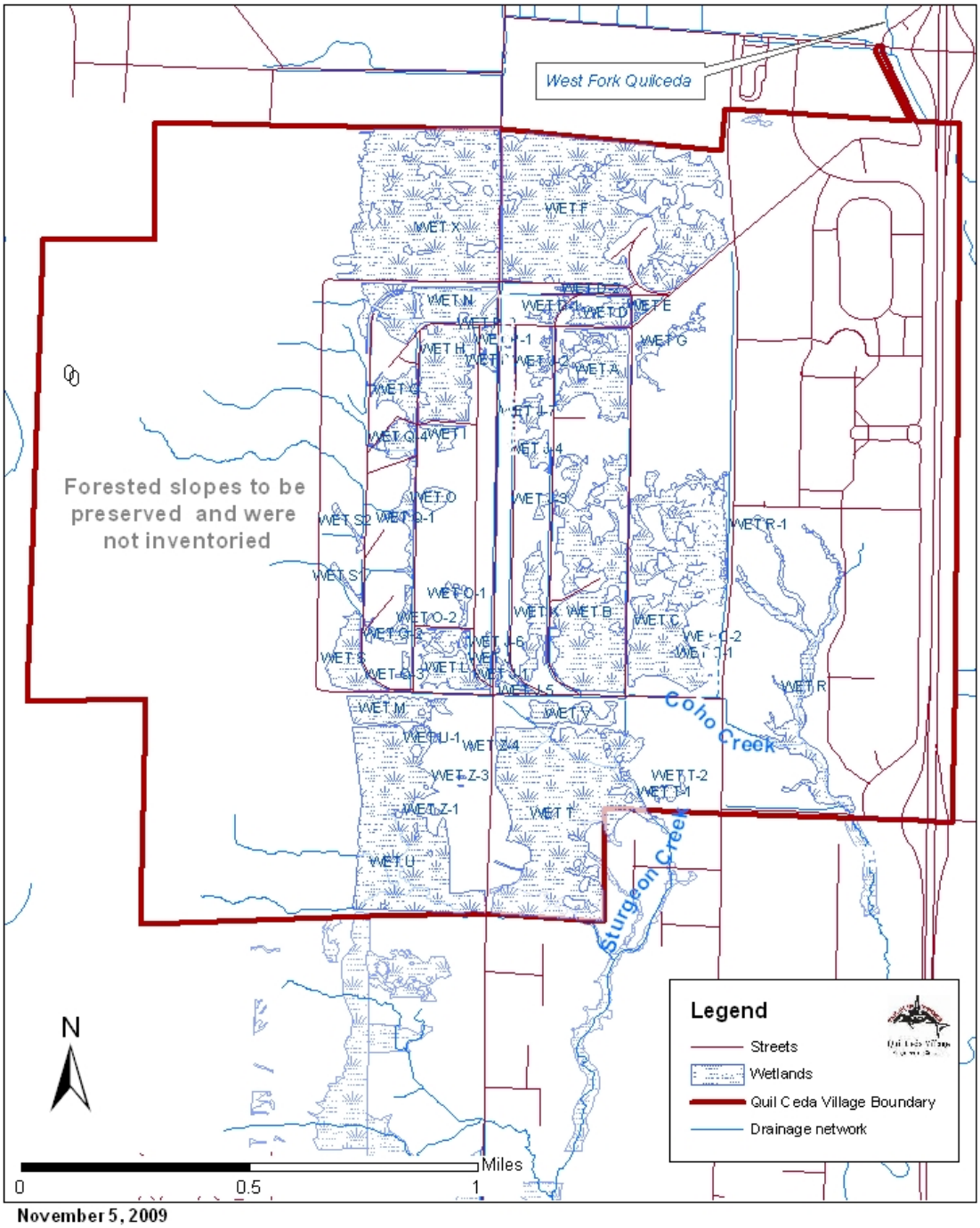

Figure 7: Quil Ceda Village Wetlands and Streams

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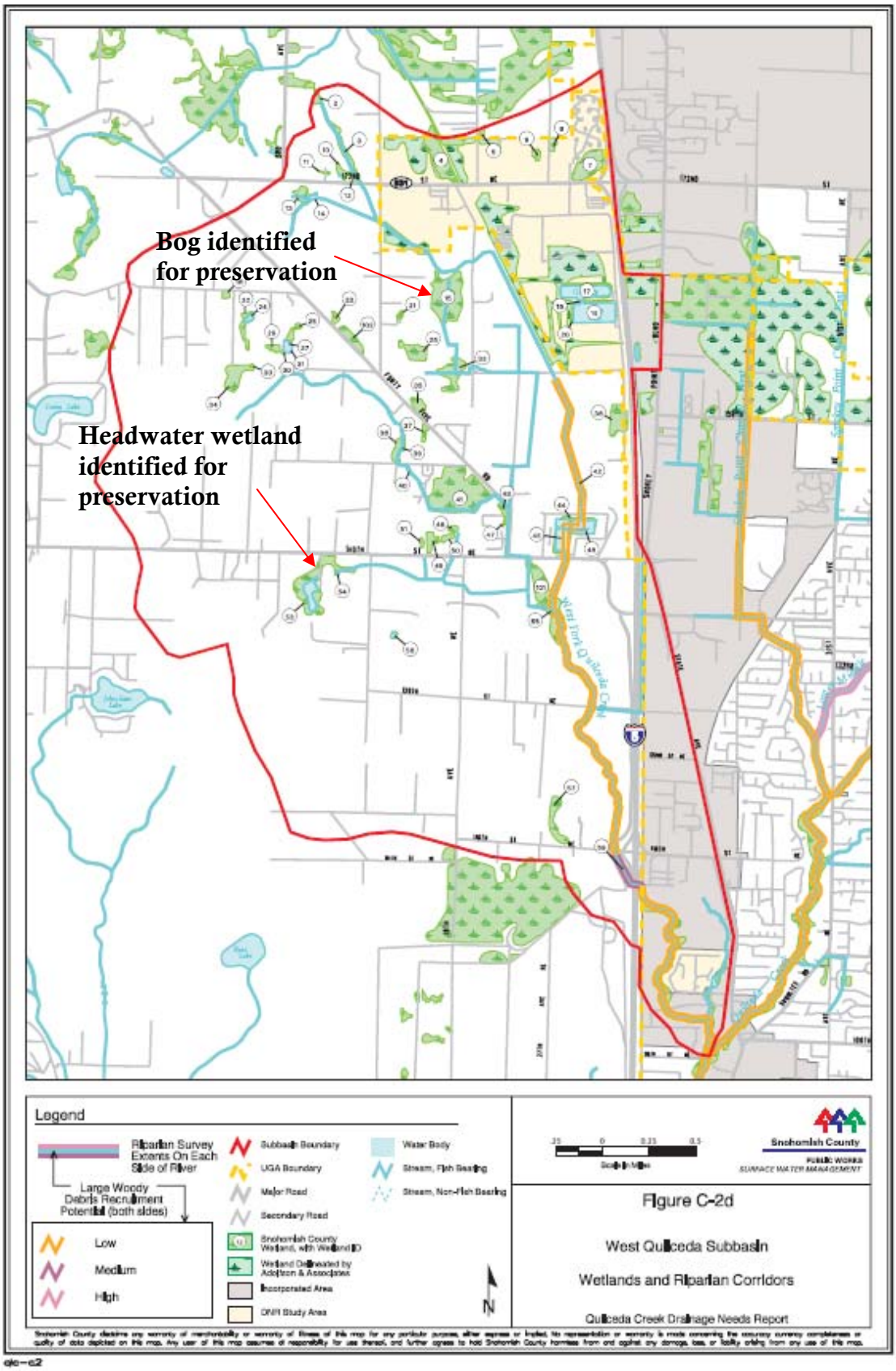

Figure 8: Wetland Inventory by Snohomish County – West Fork Quilceda Watershed

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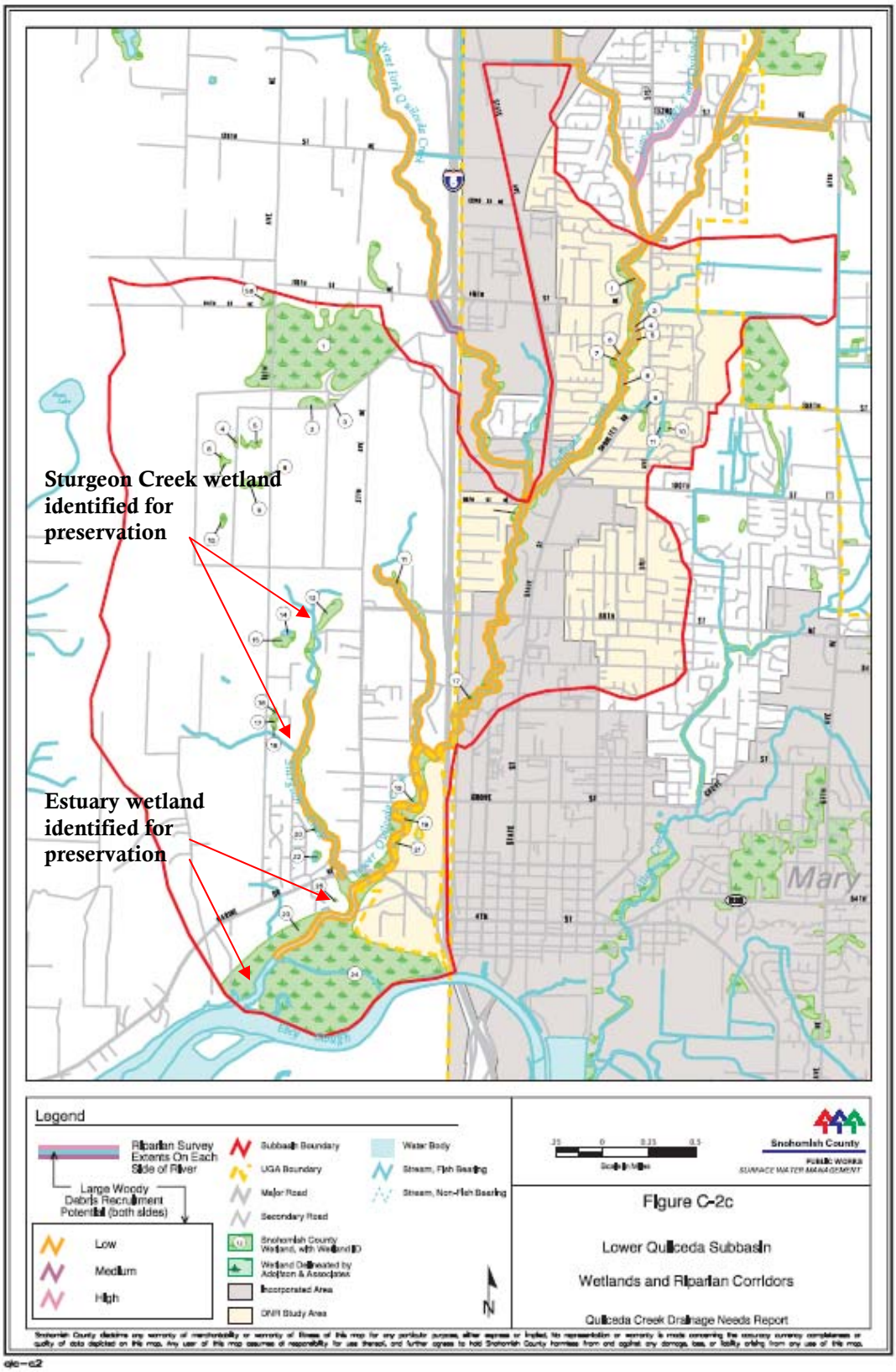

Figure 9: Wetland Inventory by Snohomish County – Lower Mainstem Quilceda Watershed (Includes Coho and Sturgeon Creek Subwatersheds)

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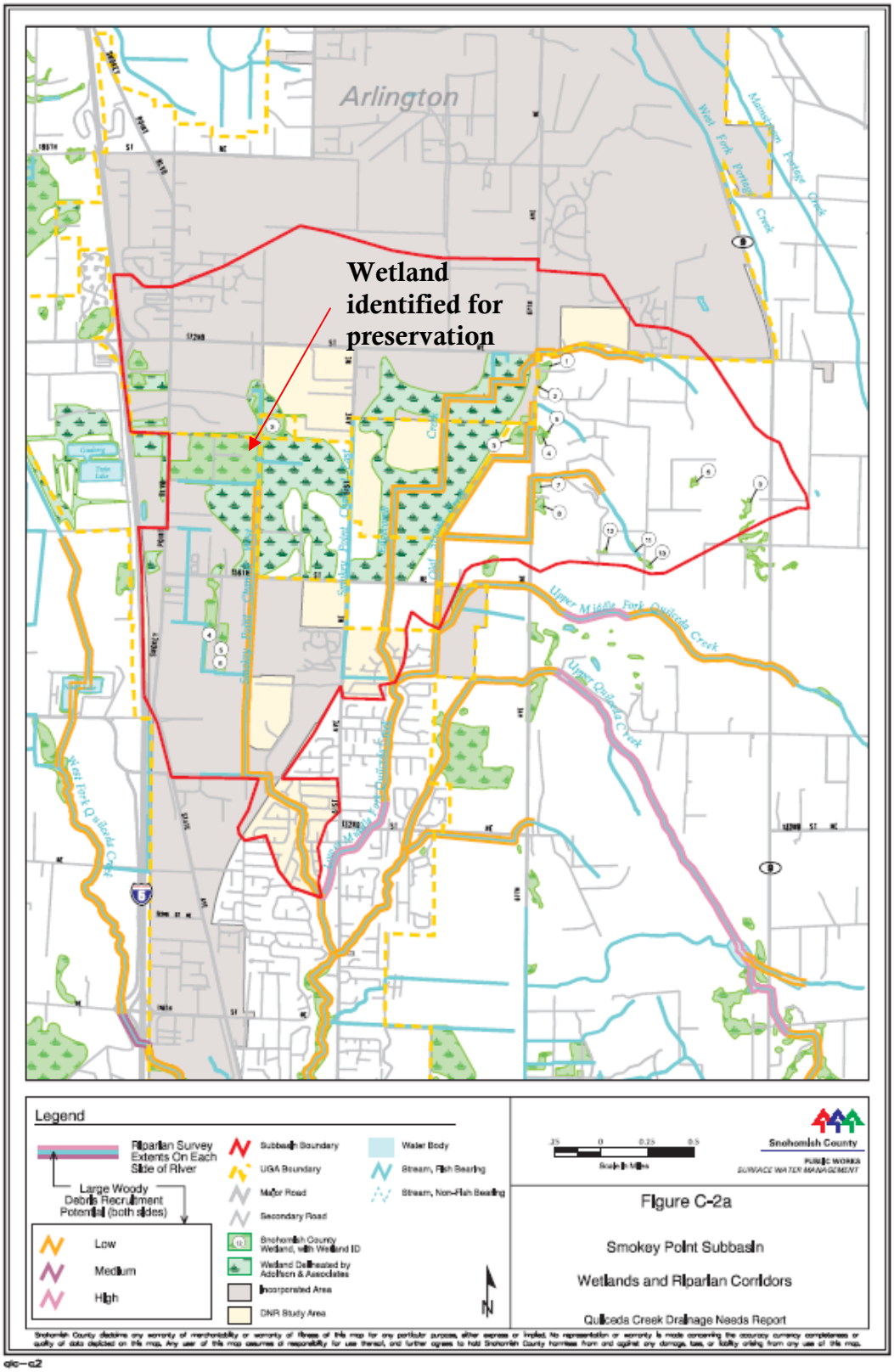

Figure 10: Wetland Inventory by Snohomish County – Edgecomb, Hayho and Olaf Straad Subwatersheds

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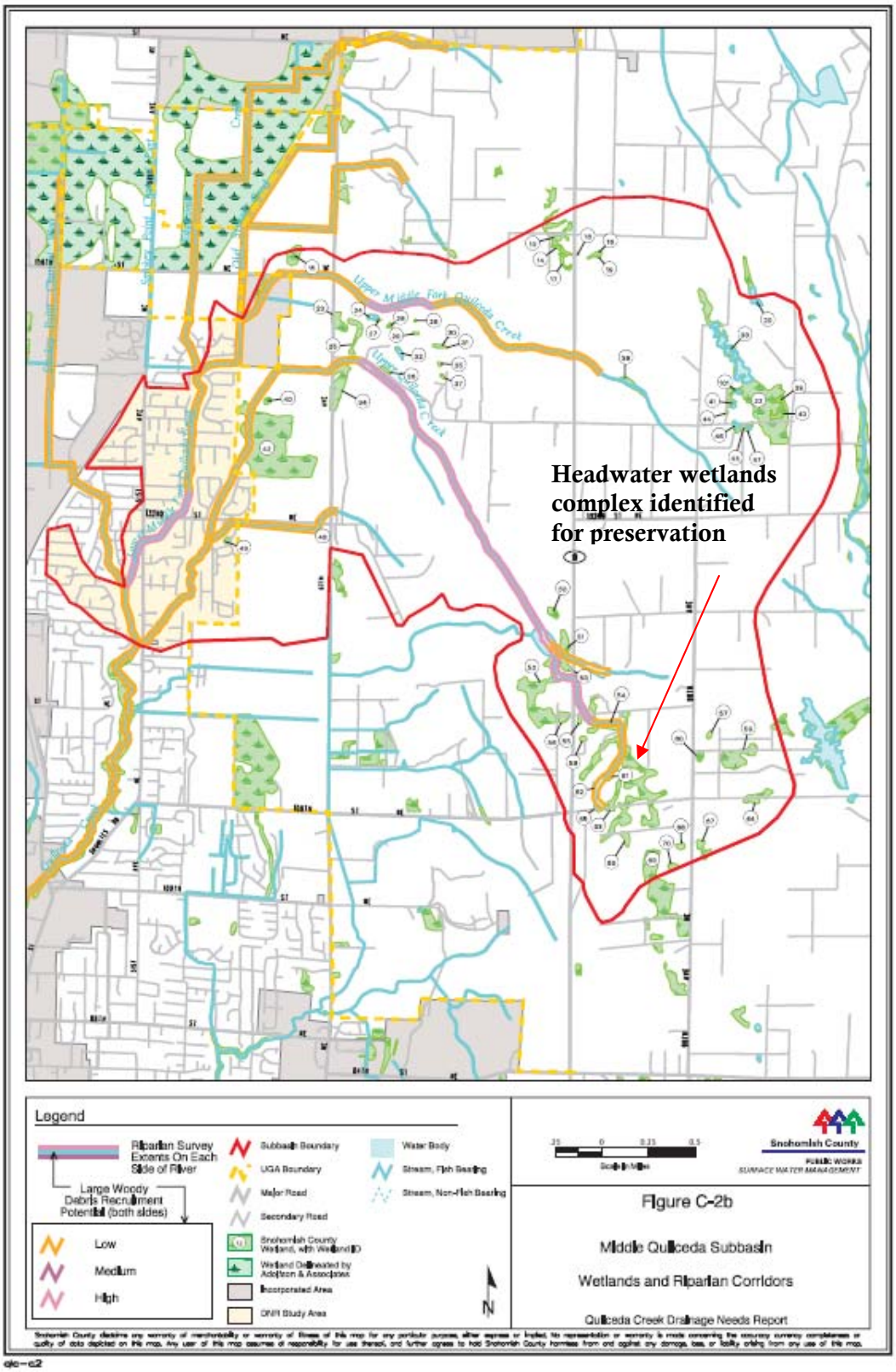

Figure 11: Wetland Inventory by Snohomish County – Middle Fork Quilceda and mainstem Quilceda Creek Watersheds

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Restoration Opportunities

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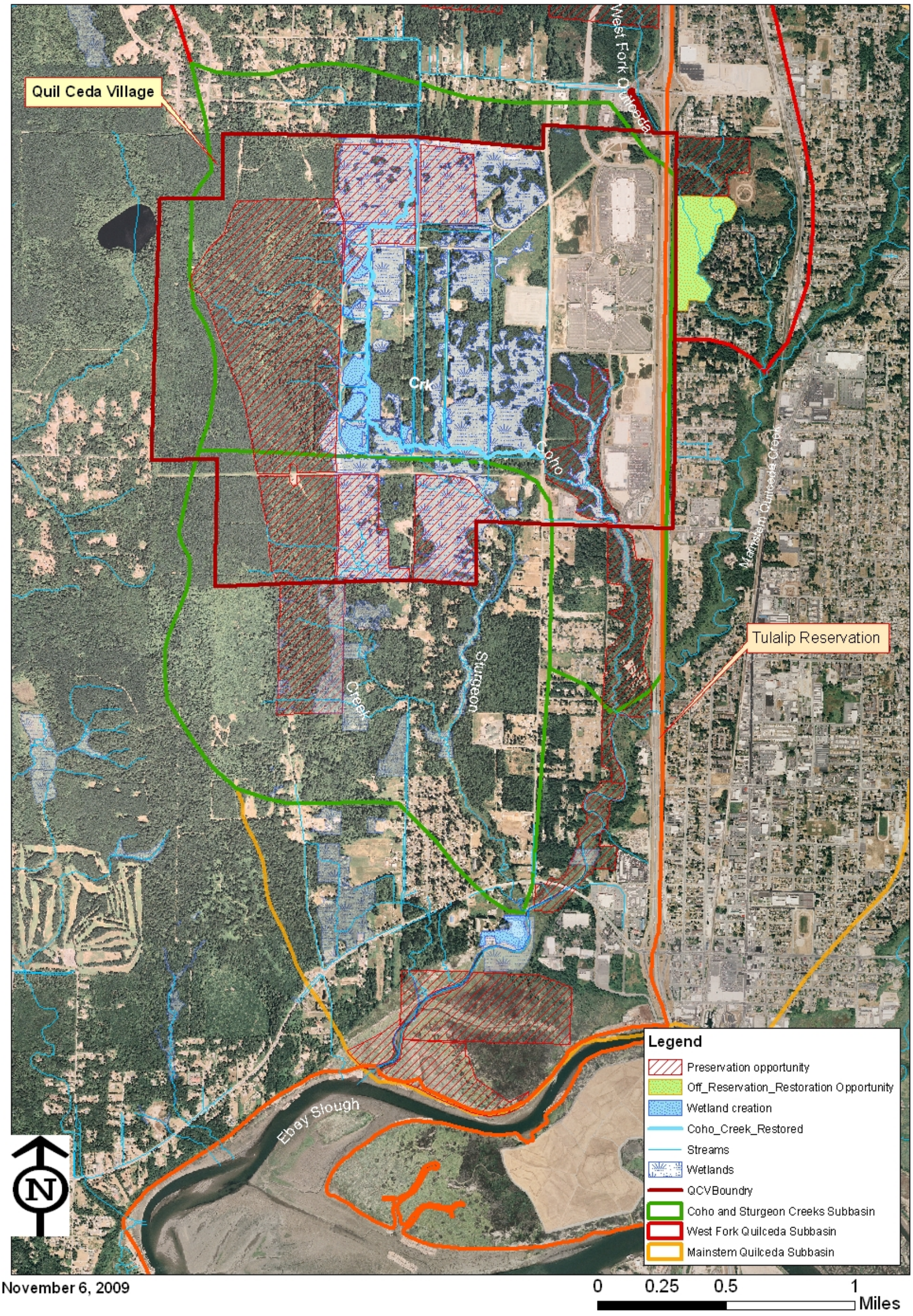

Figure 12: Restoration opportunities in the Coho, Sturgeon and Lower Mainstem subwatersheds

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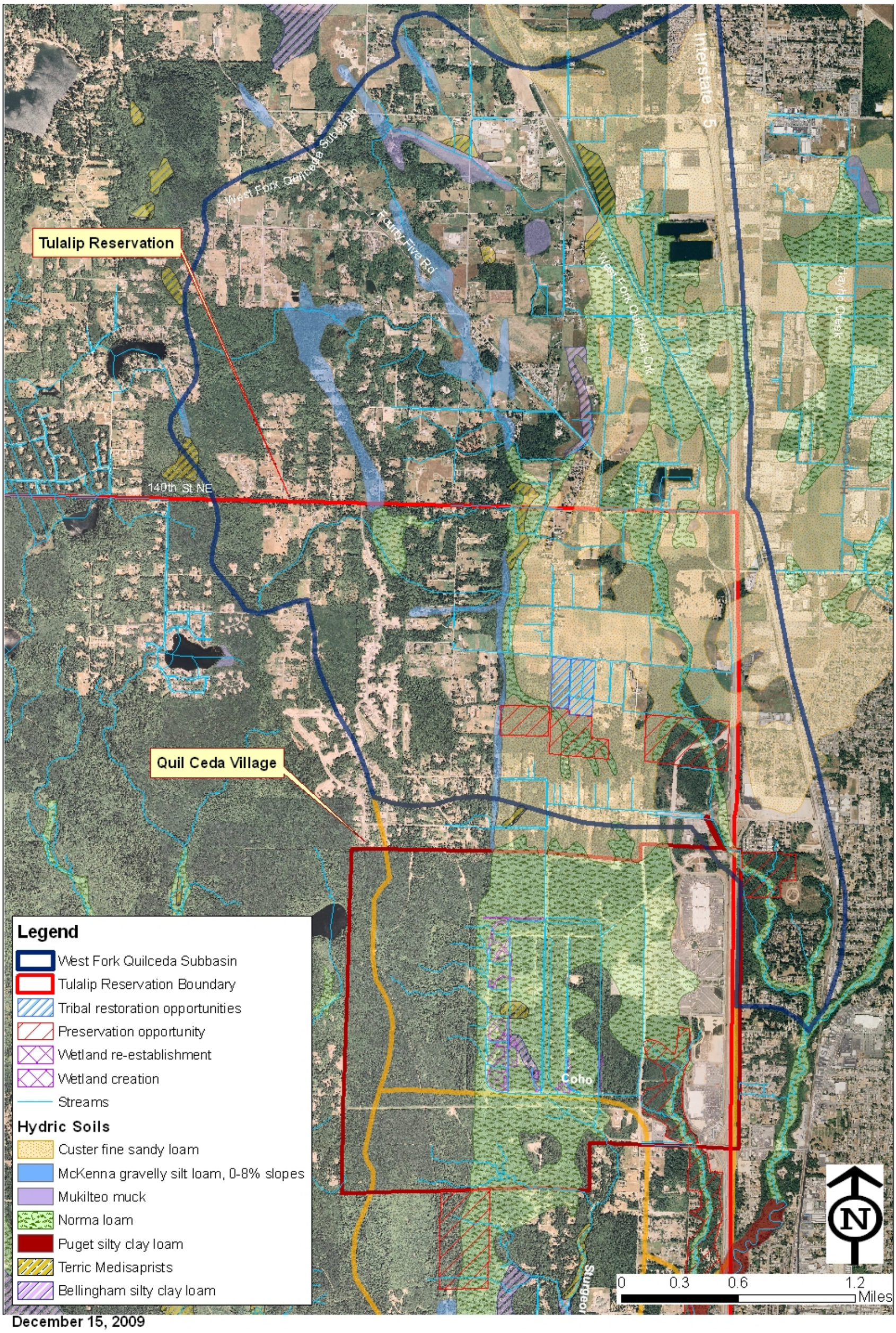

Figure 13: Restoration opportunities in the West Fork Quilceda Subwatersheds

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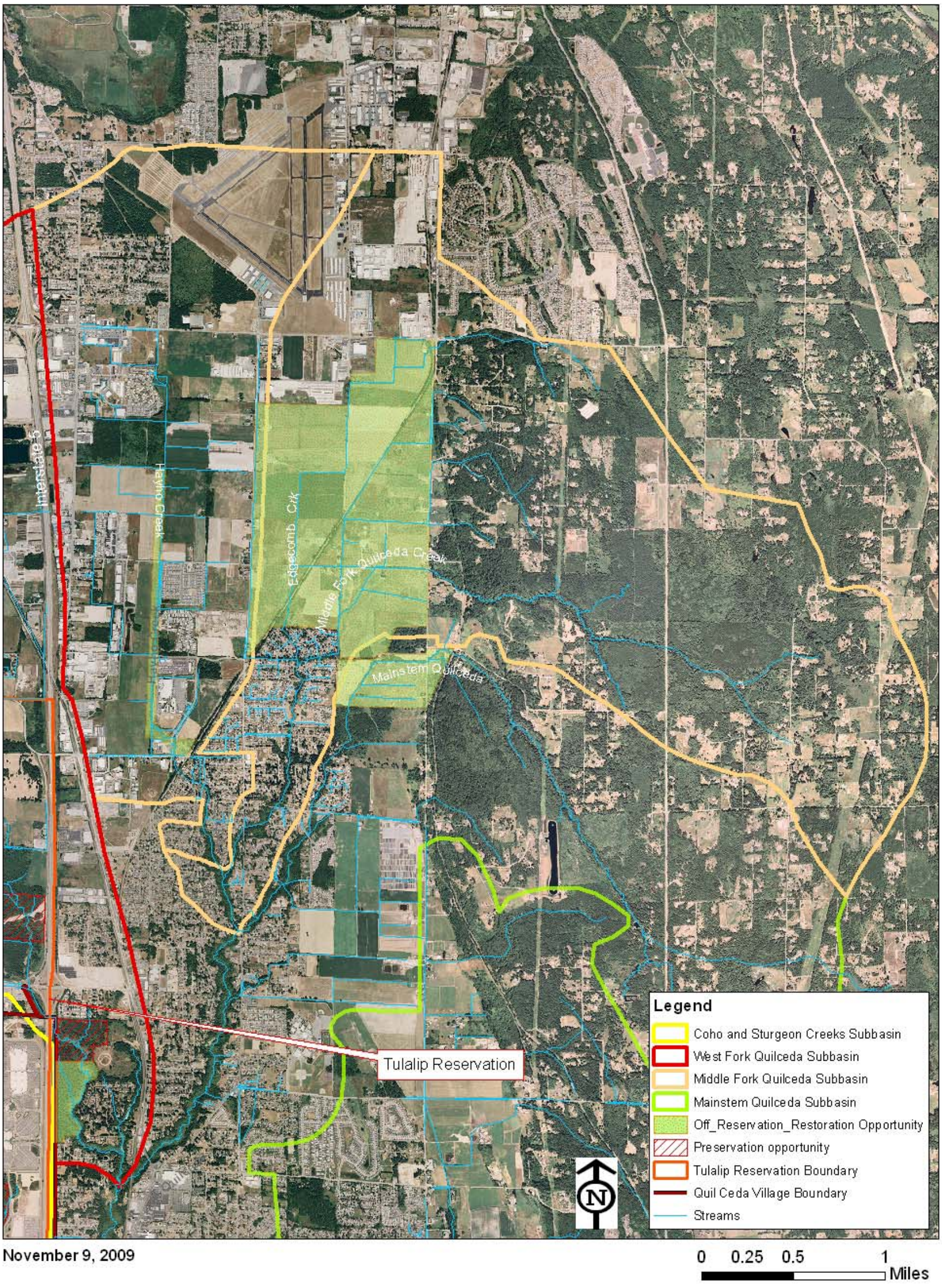

Figure 14: Restoration opportunities in the Edgecomb, Hayho and Middle Fork Quilceda Subwatersheds

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Wetlands Mapped in the Quilceda/Allen Watershed Management Plan

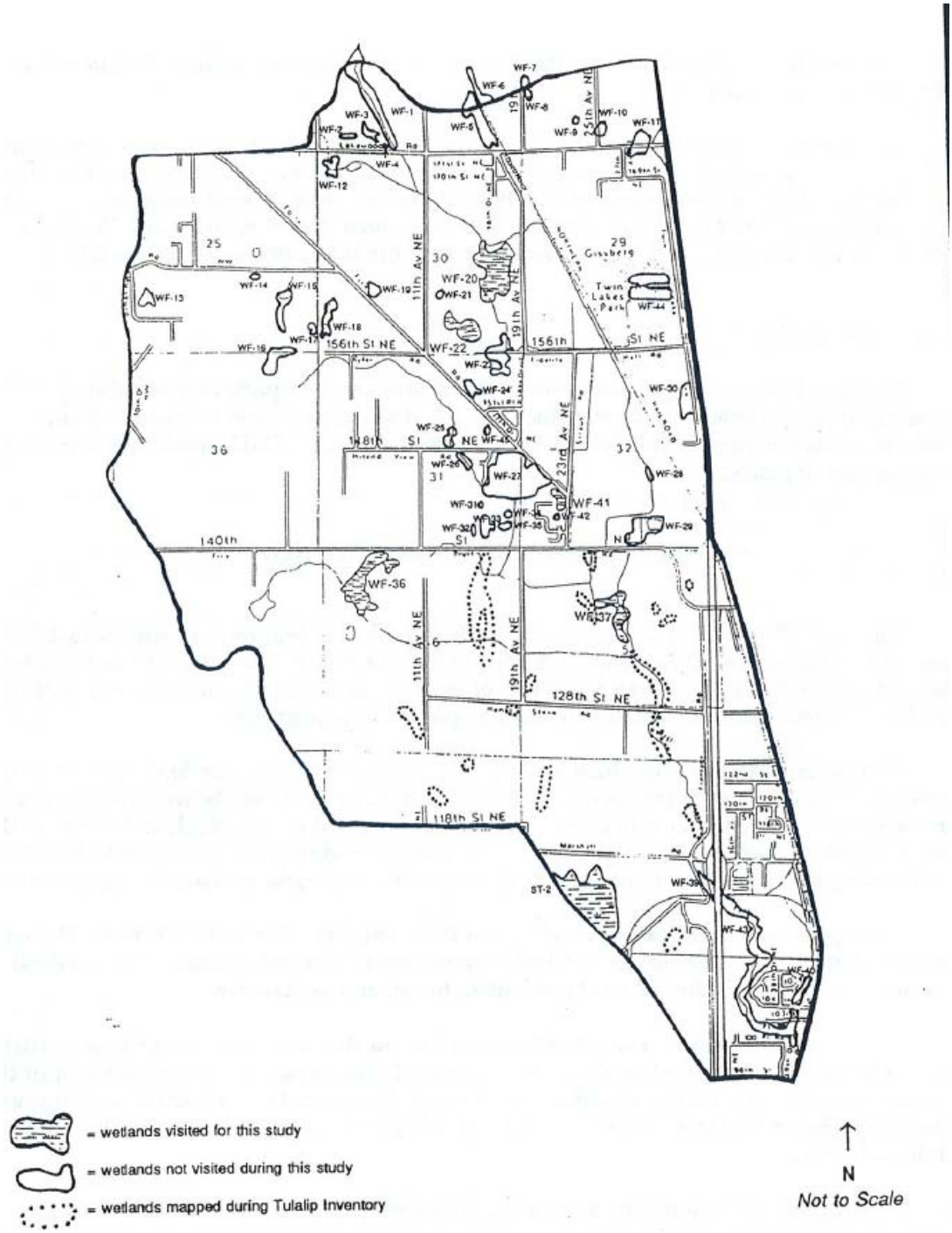

Figure 15: West Fork Quilceda Subwatershed Basin Wetlands Mapped (Quilceda/Allen Watershed Management Plan) (Snohomish County Public Works, 1998)

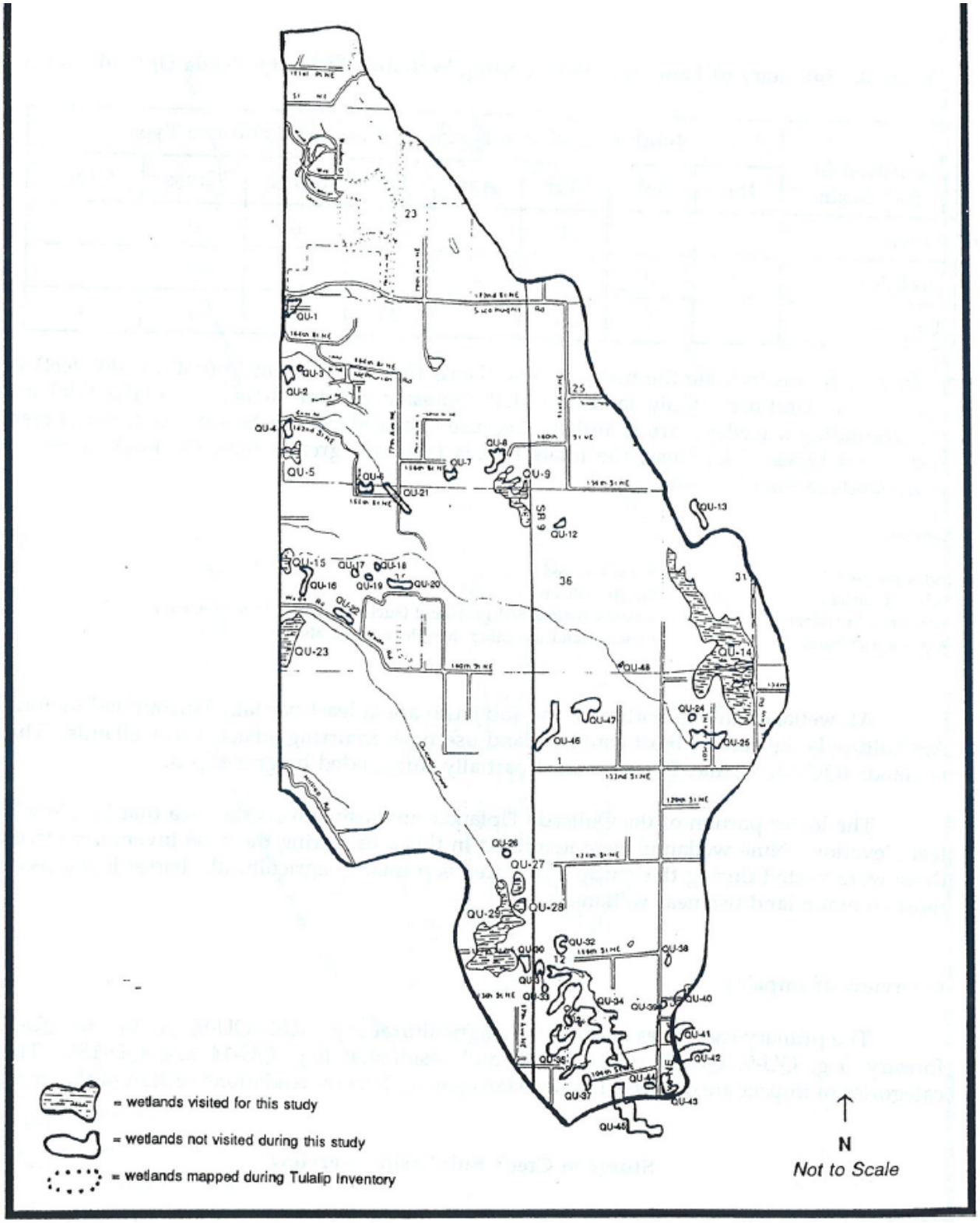

Figure 16: Wetlands Mapped in the Middle Fork and Upper Mainstem Quilceda Subwatershed Basins (Quilceda/Allen Watershed Management Plan) (Snohomish County Public Works, 1998)

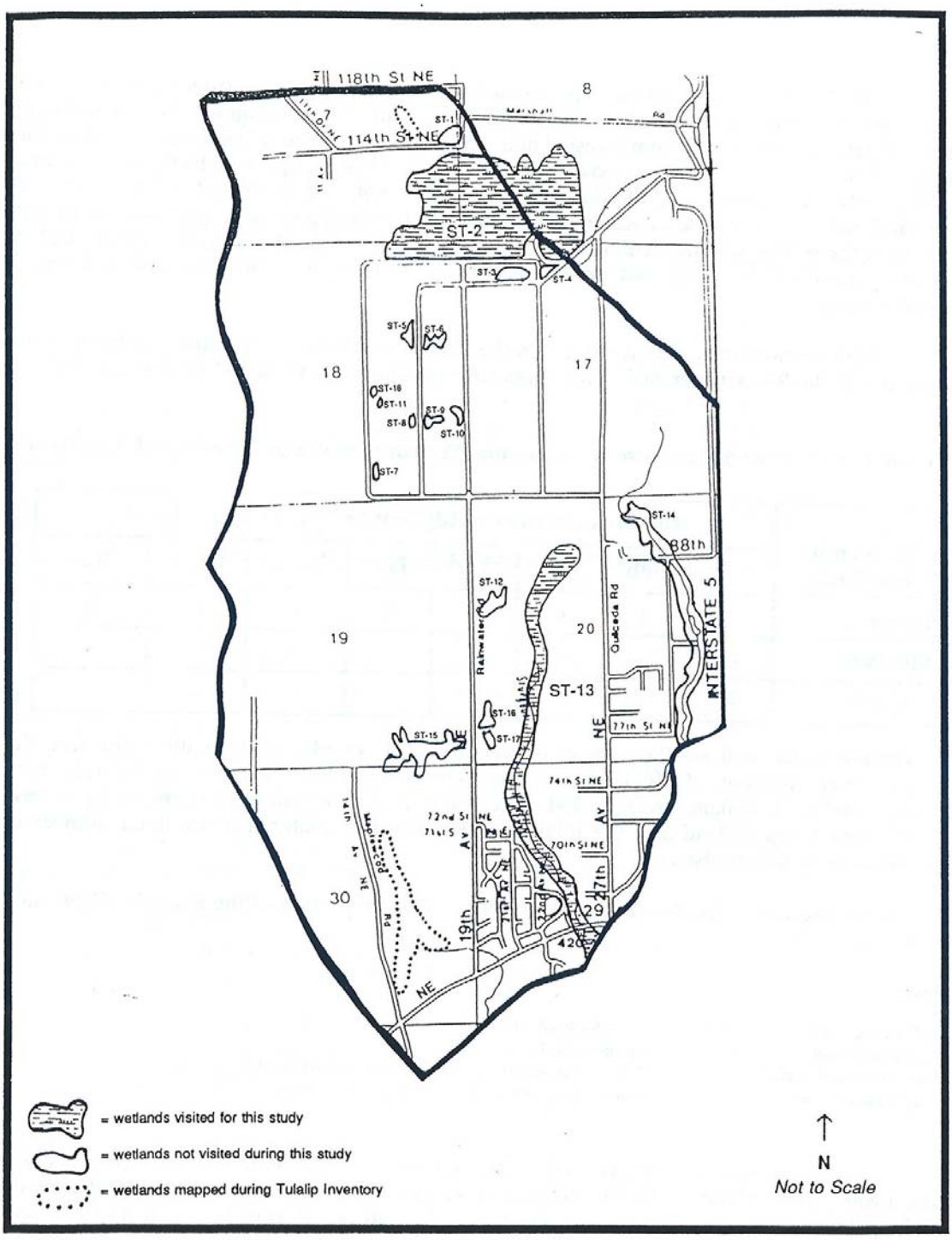

Figure 17: Wetlands Mapped in the Sturgeon and Coho Creek Subwatershed Basins (Quilceda/Allen Watershed Management Plan) (Snohomish County Public Works, 1998)

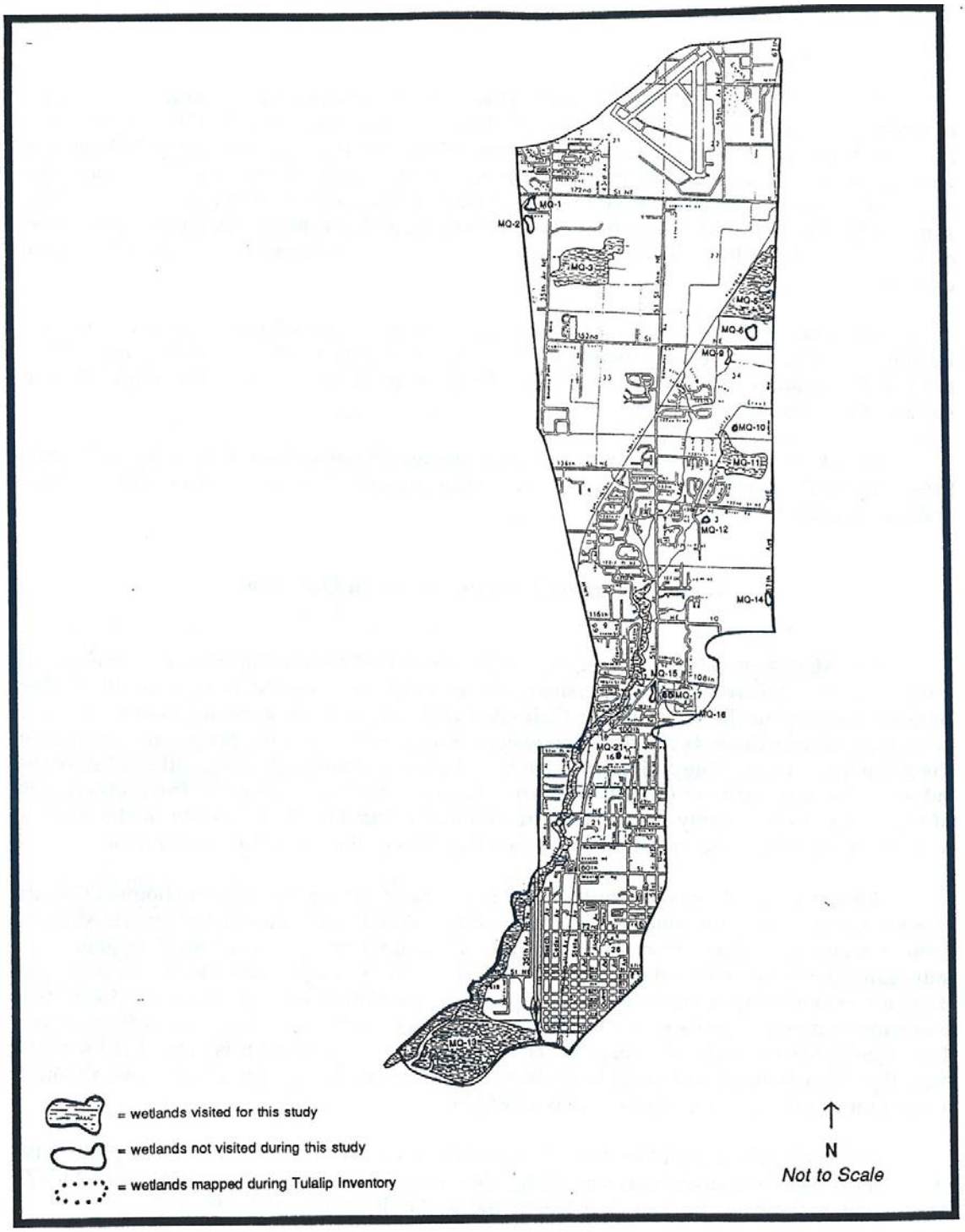

Figure 18: Wetlands Mapped in the Edgecomb, Hayho, and Middle Fork Subwatershed Basins (Quilceda/Allen Watershed Management Plan) (Snohomish County Public Works, 1998)

Water Quality Monitoring Stations

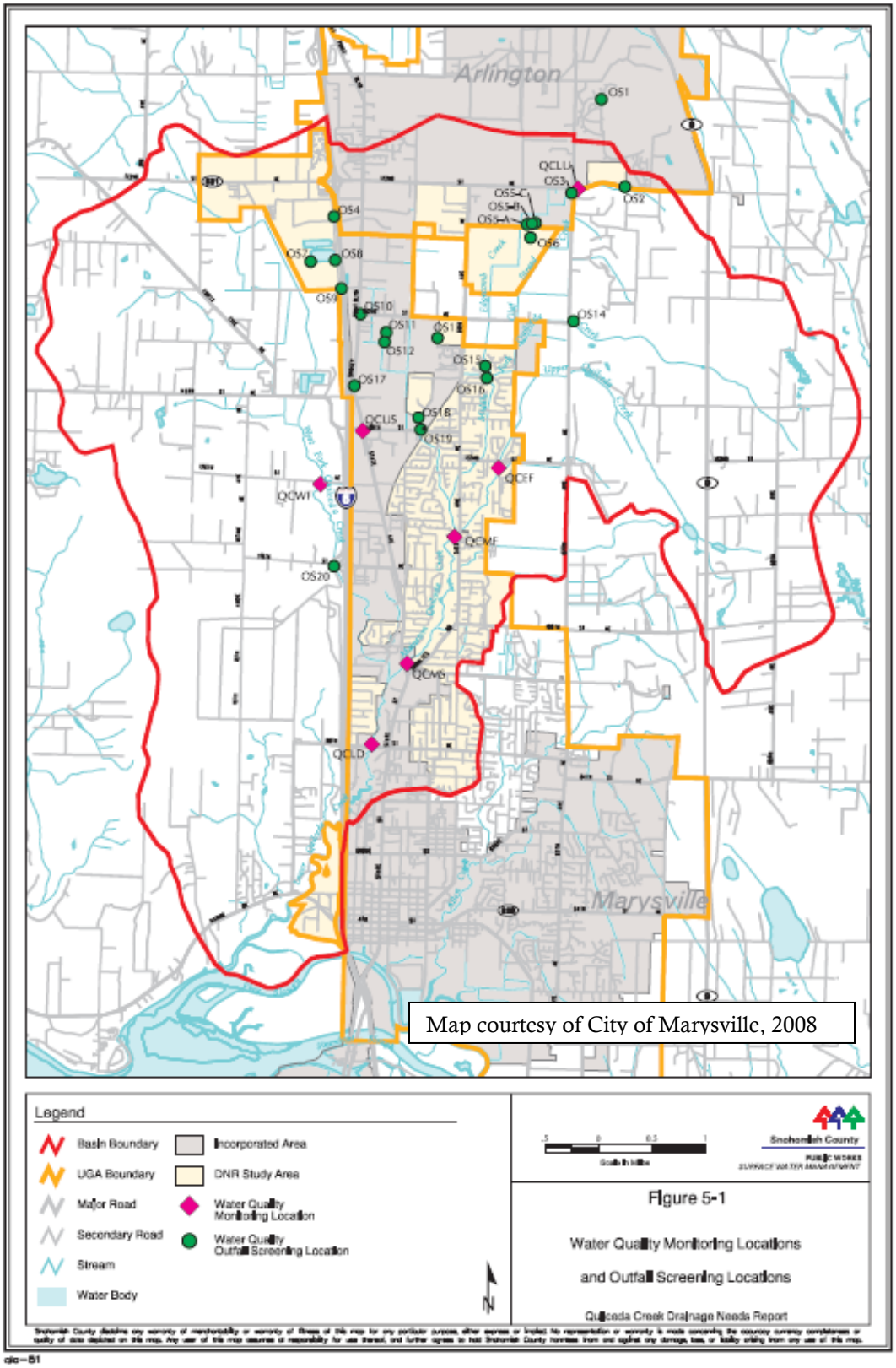

Figure 19: Water Quality Monitoring Stations- City of Marysville

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Figure 20: Water Quality Monitoring Stations-West Fork Quilceda Creek- Tulalip Tribes . (Courtesy of Tulalip Tribes, 2008)(Eastman, 2008)