Thurston County Voluntary Stewardship Program Work Plan

Appendix H – Watershed Plans and Baseline Conditions

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1 Thurston County Overview

Thurston County contains a total area of 737 square miles, or 471,713 acres. Thurston County consists of diverse land covers ranging from the coastal lowlands and prairies to the foothills of the Cascade mountain range. The County's geography includes a significant amount of shorelines, lakes, ponds, and rivers. In addition, due the history of glacial terminus activity, much of the county is composed of soils considered to be sensitive for aquifer recharge. The County also contains an estimated 10,335 acres of rare Puget Sound oak prairie, which used to be plentiful in the southern Puget Sound area but today only 3% of the prairies remain intact due to urban development, agriculture, and coniferous forest encroachment (Earth Economics, 2012).

Approximately 688 square miles (440,545 acres), or 93 percent of the total area, lies in unincorporated Thurston County. The remaining seven percent is divided among the seven incorporated cities and towns of Olympia, Lacey, Tumwater, Bucoda, Rainier, Tenino, and Yelm. Major landowners in the unincorporated county include the State of Washington (including Capitol Forest), the federal government (including Fort Lewis and Nisqually Wildlife Refuge), and private timber companies.

More than 265,000 people call Thurston County home (US Census, 2014). Thurston County is one of the fastest growing counties in the state and has consistently exceeded Washington State's overall rate of growth. The overall average growth rate between 2000 and 2010 was 2.0% and between 2010 and 2014 the population increased by 5.4%. Approximately 52% of Thurston County residents lived outside of cities in 2014, with 21% living in unincorporated Urban Growth Areas and 31% living in rural areas (Thurston Regional Planning Council, 2014).

There are many problems associated with rapid population growth. For example, development of land for residential and industrial uses not only increases impervious surfaces, which damages the health of the local watersheds, but also reduces the amount of land available for agricultural activities, fragments and degrades fish and wildlife habitat, and increases the potential for flooding and non-point source pollution. . Impervious surfaces are hard surfaces that stop water from infiltrating into the soil. They include things like rooftops, parking lots, roads, and even compacted lawns. Imperviousness decreases the ability of the ground to absorb water and recharge aquifers. The increased volume and velocity of storm water associated with impervious area erodes stream banks, causing flooding, habitat loss and degradation, and fills the streams with sediment. Furthermore, water flowing over impervious surfaces can pick up contaminants, which can have a negative effect on the biotic communities living in the aquatic ecosystem and decrease overall stream quality, as well as reduce the safety and quality of water resources. A total of 4.9% impervious surfaces were estimated in Thurston County as of 2010, with a projected increase to 5.9% by 2035 (Thurston County, 2013).

1.1 Agricultural Economy

Thurston County recognizes the importance of supporting a local natural resource-based economy, which includes the job creating opportunities in forestry, agriculture, and aquaculture, as well as tourism.[1] The county's environmental quality plays an important role in the area's economic health and effective management of growth can protect the variety of living styles in the county as well as the natural environment. Conservation of the farm and forest land base is an important concern for the county with the vision to ensure that these areas and activities will be available to future generations.

Natural resources and working lands have been a mainstay of the economy of Thurston County for over 200 years. Forestry in particular dominated the economy until the middle of the 20th century. In the 1950's Thurston County was primarily farmland, and in subsequent years over 75 percent of working agricultural lands had been lost (WSU Thurston County Extension, 2015). The South of the Sound Community Farmland Trust (SSCFLT) reported that in the 5-year period from 2002 to 2007 nearly 50 percent of the remaining working farmland had been lost.

The United States Department of Agriculture (USDA) census[2] in 2007 reported 80,617 acres of farmland, which decreased to 76,638 acres of farmland most recently reported in 2012. The 2012 USDA census of agriculture reported a market value of over 122 million dollars for agricultural products in Thurston County, which increased from the 117 million dollar market value reported in 2007. The market value of agricultural products sold is divided into crops, including nursery and greenhouse crops at roughly 48 million dollars, and livestock, poultry, and their products at roughly 73 million dollars in 2012. However, the 2012 USDA census reported that the net cash farm income of operators in Thurston County decreased from nearly 22 thousand dollars reported in 2007 to just over 15 thousand dollars in 2012. Furthermore, in 2012 net losses of farm income were reported by 1,023 farm operators in Thurston County, which increased from the 996 farm operators that reported net losses in 2007.

The 2012 USDA census also reported that the number of farms in Thurston County increased from 1,288 in 2007 to 1,336 in 2012, while the average size of farms decreased from 63 acres to 57 acres. This shows a trend in the average size of farms decreasing while the number of small farms increases. As the Profile of Small Farms in Washington State Agriculture (Ostrom & Donovan, 2013) found, small farms are an important community asset and provide economic contributions as well as critical environment, aesthetic, cultural, and social functions and benefits. The 2012 USDA census also found the total number of farms that were in full ownership by the operator to be 1,150 and the farms in partial ownership were 140, while the number of farms with tenant operators were 46 and 1,238 of the operators lived on the farm operated. The primary occupation was found to be farming for 410 farm operators and other for

[1] *Thurston County Comprehensive Plan* (2004). Last amended by resolution 14845 on May 20, 2014. Available: http://www.co.thurston.wa.us/planning/comp_plan/comp_plan_home.htm

[2] The USDA census of agriculture is a self-reported survey that is mailed to farm and ranch operators. It does not capture all agricultural operations, however it is the most consistent source of data. More information is available at: https://www.agcensus.usda.gov/

926 of farm operators. The average age of farmers in Thurston County was found to be 59 in 2012 and 70% of farmland is expected to change ownership in the next 20 years.[3]

Aside from the raw economic benefits from the sale of agricultural goods and tourism, well-managed agricultural lands provide aesthetic, recreational, and intrinsic values, as well as wildlife, nutrient cycling, flood and disturbance regulation, and a multitude of other services. While these services are difficult to quantify, they can be assumed to provide another layer of benefit to the economy of the county and the quality of life for residents.

1.2 Farmland at Risk

In addition to the direct and ancillary economic benefits that agricultural operations provide to the county, working lands and those that manage them can also make positive environmental and cultural contributions. However, for these effects to be realized the business of agricultural production must remain economically viable and the land base that supports it must remain intact.

The South of the Sound Community Farm Land Trust (SSCFLT) completed the Thurston County Farmland Inventory (2009) in order to better understand the amount of farmland in Thurston County and risks of conversion. The primary goal of the Farmland Inventory was to develop a county-wide census of agriculture and a Geographic Information System (GIS) that could be used to determine priority conservation areas as well as strategies for protecting farmland. Most of the analysis was completed with local parcel data and GIS software as well as data from the USDA census of agriculture and utilized over 30 data sets. SSCFLT calculated 68,247 acres of farmland in the inventory, which contrasted with the 80,617 acres reported in the 2007 USDA census of agriculture. This may be due to the fact that federal data is based on self-reported info from surveys and mathematical estimates, while the Farmland Inventory was based on actual data about features of specific parcels. The inventory found that a total of 90,023 acres of farmland had been lost between 1950 and 2008.

The results from the Farmland Inventory report suggested that a majority of Thurston County's farmland is at risk of being converted to other uses due to these factors: 75 percent of the farmland is within three miles of an urban growth boundary; approximately 51 percent of the farmland is in the open space tax program; the majority of farmland is not within a Long Term Agricultural zone; the average age of principal farm operators is 57 years old; and the majority of land in farms is rented land.

The Farmland Inventory report also found that, along with the significant farmland base and local farm economy in Thurston County, an estimated 50 percent of the farmland contains or is adjacent to areas that provide important fish and wildlife habitat. The challenges and opportunities this presents to local agricultural operators is significant and highlights the need for protection strategies that will mutually benefit farming and critical areas.

[3] http://www.trpc.org/633/Farmland-Snapshot

1.3 Background on Farmland Protection

Prime farmlands in Washington State have been documented in the National Resources Inventory conducted by the Natural Resources Conservation Service (NRCS). Lands with an ideal combination of physical and chemical characteristics for producing feed, forage, fiber, and oilseed crops are considered prime farmlands. Level, deep and well-watered soils that have no serious limitations for use and management constitute prime farmlands (NRCS, 2001). In Washington State, the National Resources Inventory has documented the gradual decrease of prime farmland as those soils are being converted to uses other than agriculture. Overall, the NRCS study found that prime farmlands decreased in Washington by about 4.8% between 1982 and 1997. The prime farmlands have decreased the most in western Washington counties, including Clark, Lewis, Pierce, and Thurston and trends indicate that they will continue to decrease.

Thurston County's efforts to support and protect agriculture was formalized over four decades ago. The Thurston County Comprehensive Plan of 1975 contained the first policy statements pertaining to the importance of agriculture and the goal to support and protect farming into the future (Thurston County Agricultural Advisory Committee, 1978). In 1976, the Thurston County Planning Commission developed a proposal for Agricultural Districts to be included in the Comprehensive Plan and Zoning Ordinance. However, concerns were expressed by the agricultural community that the proposal did not account for economic realities the farmers faced and the Planning Commission did not approve the amendments (Thurston County Agricultural Advisory Committee, 2010). In 1977, the Commissioners did include a "Nuisance Amendment" to the Comprehensive Plan in an effort to restrict development adjacent to farms.

The same year (1977) a request was made to the Board of County Commissioners to establish a citizen's committee to study agriculture in the county and provide recommendations to the Commissioners. The committee was formed of 22 representatives of the agricultural community and other interested citizens and they provided a report to the Commissioners in 1978 titled, *Agriculture in Thurston County: A Citizen's Report.* Recommendations in this report included establishing the Thurston County Agricultural Advisory Committee, amending the Comprehensive Plan and Zoning Ordinance to set up a voluntary Agricultural Area, providing signage in agricultural areas, and annual tours for decision makers. The Agricultural Advisory Committee is still active and provides advice to the Commissioners and reviews development applications that are relevant to agriculture in Thurston County.

In 1978-79, the federal Clean Water Act provided funding to hire field technicians and assist landowners to improve water quality. The Washington State Conservation Commission (WSCC) worked with state agencies to assist landowners. For example, per a 1988 agreement between the Department of Ecology and WSCC, conservation districts were allowed to help farmers voluntarily solve water pollution problems before the Department of Ecology took action to enforce water quality standards. The WSCC continues to work with conservation districts to help farmers protect natural resources through the use of proven, incentive-based conservation practices. Conservation districts provide both technical and financial incentives to landowners for the implementation of conservation practices.

The adoption of the Growth Management Act (GMA) in 1990 provided another significant milestone in the efforts to support agriculture. The GMA required all counties to inventory natural resource lands and to support them in land use planning activities. In response, Thurston County established natural resource zones of long-term commercial significance. Discussions of enabling Transfer of Development Rights were also initiated and agricultural lands in the Nisqually Valley were qualified to participate in a Purchase of Development Rights program.

In 1994, the Agricultural Advisory Committee and Thurston County Staff prepared a report on *Agriculture in Thurston County—1994 Farm Survey and 1992 Census Report* based on responses in the survey. Recommendations in this document were to:

- *Continue to support the Thurston County Agricultural Advisory Committee, the Washington State Cooperative Extension program and other agencies which assist farmers*
- *Support the Farmer's Market*
- *Provide assistance to farmers through a marketing brochure for direct sales of produce*
- *Consider a 'locally produced' labeling program.*
- *Provide public information about already enacted right-to-farm ordinances and on-farm marketing regulations.*
- *Continue to provide public information about farming in Thurston County including signage, public programs, and publications.*

In 2010, the Agricultural Advisory Committee presented the *Thurston County Working Lands Strategic Plan* to the Board of County Commissioners who approved the resolution to adopt it on June 15th 2010. This Strategic Plan established a basis for encouraging a coordinated approach to maintain the economic viability of agriculture and forestry, and outlined threats, opportunities, and strategies to protect working lands. The Strategic Plan recognized that the most effective solutions for working lands should be voluntary, address sustainability and issues of perpetuity, as well as help ensure the economic viability of working lands. Threats and opportunities identified include: political factors such as the laws and regulations that affect working lands at the federal, state, and local level; economic factors including access to markets and infrastructure; social factors, with the largest threat being the increasing population and resulting urbanization pressures on rural areas; and environmental factors, where concerns often focus on environmental laws and regulations. However, there are also opportunities to demonstrate the contributions that working lands make to protect environmentally sensitive areas, air and water quality, and wildlife habitat and species, among other environmental services and benefits provided by well managed working lands.

Opportunities identified in the Strategic Plan related to the strong commitment in the natural resources arena for collaborative problem solving. The Strategic Plan also recognizes that Thurston County has several strengths in its effort to conserve working lands and support the people who work them. These strengths include: the typical land ethic and stewardship of those involved with working lands; a diverse agricultural base and new farmers; success of marketing efforts such as direct sales and Community Supported Agriculture; public support for a local agricultural economy; and legal support, including right

to farm, the Purchase and Transfer of Development Rights programs, and the Thurston County Comprehensive Plan.

Maintaining the long-term viability of agriculture is a high priority for Thurston County. Chapter 3 (Natural Resource Lands) of the *Thurston County Comprehensive Plan* (2004) describes strategies for accomplishing the Growth Management Act (GMA) goal (as per RCW 36.70A.020) to "Maintain and enhance natural resource based industries, including productive timber, agricultural, and fisheries industries. Encourage the conservation of productive forest lands and productive agricultural lands, and discourage incompatible uses" (p. 3-1). This statewide goal is implemented in Thurston County through policies and programs that are tailored to the local community's vision for the future of agriculture, aquaculture, forestry, and mineral resources.

The Comprehensive Plan identified the community vision for agricultural resources as well as goals and objectives to accomplish that vision. The community envisions "a diverse and thriving agricultural industry that is able to respond quickly to changing market conditions." Thurston County residents recognize the importance of local food production in maintaining the quality of life and long-term sustainability of the community as well as the multiple benefits provided by farmland, including fish and wildlife habitat, flood control, and the natural resource stewardship that farmers provide. As a whole, the community takes responsibility for "conserving prime farm lands, promoting local markets, minimizing incompatible land uses, and providing other community support". In general, agricultural operators take responsibility for "preserving soil fertility and ground and surface water quality, and for promoting a land stewardship ethic for existing and future generations".

The Comprehensive Plan places emphasis on protecting the economic viability of agriculture businesses to encourage agricultural producers to continue to serve as stewards of the land and waters of southern Puget Sound. Many different factors affect agricultural activities in Thurston County, including markets, federal, state, and local regulations, land costs, water rights issues, and the proximity of incompatible land uses. Agricultural activities are also affected by limited infrastructure such as processing plants and agricultural suppliers as well as access to local markets. Agricultural operators have specifically identified the need for more information about the industry, including applicable regulations, incentives and financial assistance programs, and technical assistance to help implement conservation practices.

Maintaining agricultural land for long-term farm use is a primary goal of the Comprehensive Plan in order to ensure that farming can continue to exist and flourish in Thurston County. Objectives and policies in the Comprehensive Plan for the protection of agriculture include:

- Conserving and enhancing agricultural lands for long-term farming use;
- Zoning to reduce conversion to other uses;
- Directing future development towards designated growth areas;
- Conservation easements;
- Transfer and purchase of development rights;
- Current-use and open-space tax programs;

- Prioritizing conservation of agricultural lands of long-term commercial significance;
- Providing land use and water management programs to conserve and enhance aquaculture areas;
- Discouraging incompatible uses on agricultural and forest lands;
- Providing regulations that support long-term agricultural uses;
- Full utilization of agricultural resources;
- Encouraging community support of local agriculture; and
- Agritourism and other innovative strategies for the protection and enhancement of agriculture

The Comprehensive Plan also recognizes that aquaculture is of statewide and national interest and like other natural resource industries, provides important economic and environmental benefit as well as intrinsic, aesthetic, and cultural values. The tide-flats of southern Puget Sound are a highly valued shellfish growing area and produce more oysters than anywhere in Puget Sound. Several land based fish farms also reside in Thurston County, which rely on plentiful, clean, and consistently cold water from aquifers. A growing population and the downstream impacts of development continue to threaten some shellfish growing areas. Protecting both ground and surface water quality is of utmost importance for commercial and recreational shellfish harvesting, which is an important aspect to quality of life in Thurston County. County policies also discourage encroachment from incompatible uses and form shellfish protection districts when shellfish growing areas are downgraded, which has increased in frequency in recent years (Thurston County, 2004).

The Comprehensive Plan and this VSP Work Plan place great emphasis on protecting the long-term viability of agriculture and protecting critical areas, which includes promoting the economic viability of agricultural activities and reducing the conversion of agricultural land to other uses such as urban development. The business of agricultural production must remain economically viable in order to accomplish the VSP goal of maintaining and improving the long-term viability of agriculture while protecting critical areas.

1.3.1 Background Studies on Farmland Protection

An important component of economic development is to collect data on the local agricultural industry and understand the opportunities, challenges, and strategies for growth. In 2012, the Pacific Mountain Workforce Development Council (PMWDC) conducted a study to identify strategies to attract, grow, and diversify industries to strengthen the regional economy and increase economic stability. The region consists of Greys Harbor, Lewis, Mason, Pacific, and Thurston Counties. One of the selected industry clusters for this data-driven analysis was food production. The food production cluster was comprised of industries involved in agricultural production and fishing as well as the transformation of natural resources into products for consumption and included the supply chain components. The primary goal of this study was to identify specific priority strategies that organizations can take to enhance existing economic development plans.

In 2011, a collaborative planning effort called Sustainable Thurston began with a simple question: "How do you want your community to look, function, and feel in 2035". Thousands of engaged residents helped the Sustainable Thurston Task Force develop a regional vision of sustainable development that encompasses land use, housing, energy, transportation, food, health, and other interconnected issues. The plan that was released in December of 2013, titled *Creating Places—Preserving Spaces: A Sustainable Plan for the Thurston Region*, was a result of the two-and-a-half year community conversation and analysis of quality-of-life issues and it's goals is to integrate sustainability into all regional decision-making to achieve a healthy economy, society, and environment. The definition of sustainability that the plan established for the Thurston Region is, "A sustainable community will enhance quality of life, foster economic viability, and protect the environment while balancing our needs today with those of future residents" (Sustainable Thurston, 2013, p. 1). The Sustainable Thurston plan identifies primary issues and estimates that current local land use plans and trends would result in losing 32% of farmlands to urbanization, which would be approximately 15,600 acres.

One of the priority goals and targets set by the Sustainable Thurston plan is to preserve environmentally sensitive lands, farmlands, forest lands, prairies, and rural lands, and to develop compact urban areas. The target set for this priority goal is that no more than 5% of new housing will locate in the rural areas, and 95% will be within cities, towns, unincorporated urban growth areas, and tribal reservations. Another priority goal set by the plan was to support a local food system to increase community resilience, health, and economic prosperity, which would include developing a local food systems plan.

A similar collaborative project called Thurston Thrives brings together community leaders from business, education, city governments, neighborhoods, local charities, and social and medical care groups. Thurston Thrives is working to ensure that Thurston County is flourishing through collaborative efforts to improve the health of the community. Nine action teams have developed preliminary strategies to advance the community's health. These teams continue to refine strategies, develop measures, and coordinate actions as the initiative moves into the implementation phase in 2015.

One of the teams formed by Thurston Thrives is the food action team. The primary objectives of the food action team include strategies to teach about eating healthy local foods, increase the volume of produce from local farms through helping new farmers start and assisting current farmers and local producers to grow, better connect local farms with food vendors, grow the market for local commodities, and build the capacity of local farmers to meet the increasing demand for local food through greater access to land, financing, business support services, new markets, and effective networking (Thurston Thrives, 2013).

A regional study to evaluate farmland protection was done for the American Farmland Trust (AFT) in 2012 titled *Losing Ground: Farmland Protection in the Puget Sound Region.* This report documented the results of a three-month study of how the twelve counties around the Sound have implemented the four pillars of farmland protection: land use regulation, purchase and transfer of development rights (PDR/TDR), property tax relief, and economic development. This study outlined important factors and priorities for farmland protection under these four pillars:

1. Land use regulations
    - Ideally, at least 75 percent of farmland would be in agriculture zones, up from 51 percent today
    - Large Min parcel sizes: at least 40 acres and preferably larger
    - Few allowable uses: restricted to farm-related businesses and other compatible uses
    - Large contiguous zones: continuous zoning with the largest areas of intact farming
2. Development rights programs
    - Purchase development rights from farmland at larger scale (at least 30 percent)
    - Dedicated funding: the conservation futures tax (CFT) and the real estate excise tax (REET)
    - Realistic TDR programs: private market fueled by urban development
3. Property tax relief
    - provide this benefit to as much of the farm community as possible (75-100 percent)
    - county planners and elected officials actively promoting tax relief for farmers
4. Economic development
    - Assistance with marketing: specifically permitting direct market agricultural uses
    - Help navigating county regulations: providing knowledgeable regulatory assistance
    - Support to beginning farmers: business planning, regulatory assistance, and access to land
    - Political advocacy for the farm industry: agricultural advisory boards

The overall findings of the AFT study suggested that farmland has declined significantly in the Puget Sound with an estimated 58% loss from 1950 to 2007. The primary issue was found to be ineffective agricultural zoning and significant loopholes in regulations. There were also problems with land conservation programs not being able to keep up with development pressures. However, the authors acknowledged that county officials and staff continue to work hard to protect the farmland that remains, although state and federal assistance is limited and most programs are insufficiently funded (Canty, Matinsons & Kumar, 2012).

The AFT study also evaluated each county using a scorecard system based on the criteria in the four pillars of farmland protection outlined above. Thurston County scored a total of 56 out of 130 possible points (Table 1). For the land use regulations pillar Thurston County scored 19 of 66 points due mostly to their estimations that the majority of farmland is zoned Rural Residential/Resource (RRR), which allows one dwelling unit per five acres and is often surrounded by residential properties. The authors of the AFT study acknowledged that this zoning is generally perceived to be poorly protective of agricultural land from development pressures.

Table 1. Thurston County Agricultural Protection Scorecard

Category	Thurston County Points	Possible Points
Regulation	19	66
Development Rights	20	38

Tax Relief	5	10
Economic Development	12	16
Total Score	***56***	***130***

Source: American Farmland Trust

Thurston County has two agricultural districts, Long-Term Agriculture (LTA) and Nisqually Agriculture (NA). LTA zoning only allows one dwelling unit every twenty acres and only allows agricultural production uses. The LTA districts are mostly located in isolated pockets in the southern portions of the county surrounded by RRR 1/5 zones. The NA district allows one dwelling unit per 40 acres with only uses related to agricultural production and is mostly surrounded by Rural Residential (RR) 1/5 zoning located near the Nisqually River. These agricultural districts combined encompassed approximately 20 percent of the total acreage of farmland in Thurston County at the time of the AFT study.[4]

In the property rights category Thurston County earned 20 out of 38 points, primarily for the Transfer of Developments Rights (TDR) program as well as the Purchase of Developments Rights (PDR) program. Transactions in these programs have centered in the Chehalis agriculture area, preserving roughly 200 acres of farmland in the LTA district. The County has also purchased development rights on farmland in LTA and NA districts around the Nisqually River, totaling approximately 950 acres.

The relatively high score in this category was also due to the fact that Thurston County was the first in the state to implement a Conservation Futures Tax (CFT) in 1989. The development rights purchased by the county were funded by CFT while a vast majority of the 3,678 acres conserved by the funds is in parks and open space. For the tax incentives category Thurston County earned 5 out of 10 points for having approximately 51% of agricultural land enrolled in the current use (Open Space) assessment program.

Thurston County earned 12 out of 16 points in the economic development category. This high score was due to the focus on agricultural marketing and the agritourism project sponsored by the Resource Stewardship Department. The Agritourism Overlay District allows for more accessory uses and simpler permitting for things that support farming like agritourism, wineries, breweries, farm bakeries, tours, and festivals with temporary accommodations for tourists. The intent of which is to strengthen the agricultural economy, environmental sustainability, and food security, and promote local agricultural activities while maintaining the areas rural heritage.

The Agritourism Overlay District (AOD) ordinance was adopted on March 13, 2012. The AOD is located primarily in the southern portion of Thurston County with a portion in the northeast county within the Nisqually River Valley (the Nisqually Agricultural District). The planning commission had a hearing and work session to review the AOD and the Thurston County Development Code, Chapter 20.08G was

[4] The *Losing Ground: Farmland Protection in the Puget Sound Region* AFT report (2012) used the SSCFLT *Farmland Inventory Report (*2009) for the total acreage of farmland, which at the time was 68,247 acres.

amended in 2013 to expand the boundary by approximately 13% and 18,500 acres to include all areas zoned Long Term Agriculture and add several large farms with business plans involving new agritourism uses. Staff identified areas that could logically be added to the AOD based on location, land use, comments received, critical areas, public roads, and other features. The AOD expansion was found to allow new rural, agricultural tourism opportunities and remove some existing regulatory barriers to accessory commercial uses on local farms.

To better maintain and improve agricultural activities and natural resource conservation on private lands it is important to understand the perceptions and motivations for participation of landowners. In 2013, a graduate student at the Evergreen State College conducted a Master's Thesis project titled *Assessment of Farm owners' Perspectives and Preferred Methods to Preserve Farmland in Urbanizing Thurston County.* This study examined farmland owner's perspectives within areas of high development potential close to a UGA boundary in Thurston County and their motivations to keep their land in continued agricultural use. The author also assessed what farmland owners perceive to be the best methods for farmland preservation and factors that contribute to a willingness or unwillingness to sell development rights (Dubois, 2013). The main results of the research were:

1) 53% of the owners plan to keep their farmland in continued agricultural use

2) 21% are willing to sell development rights to preserve their farmland;

3) 70% manage pasture for beef cattle and forage;

4) 85% of farmland owners farm part-time and rely on nonfarm income for living expenses;

5) Farms over 200 acres are more likely to withstand development pressure even if located less than one mile from a UGA boundary;

6) Farms over 200 acres are also more likely to consider placing a conservation easement or selling development rights to protect agricultural land; and

7) Only 2% of farmland owners attribute economic viability as the main reason to retain agricultural land

This study also found that there was more of a willingness among large and mid-size farm owners to favor permanent farmland protection measures (PDR or conservation easements). The overall perspectives included an emphasis on broad societal benefits of protecting farmland (food and national security, and societal and environmental benefits/open space amenity values), limitations to farmland protection measures (zoning and critical area regulations), and issues with zoning agricultural land and land value (reduction in value needs compensation).

The results of this study suggested that the primary motivations to preserve individual ownerships of farmland were for conservation values, family heritage values, and economic considerations ("anything but development"). The participating farm owners did not agree that rural residential zoning, at a rate of

one residence per five acres, was an effective strategy to protect agricultural lands. They also viewed it as negative to have lands regulated, with restrictions beyond a farm use, without compensation to the owner for loss of value. A conservation easement with a farm plan was preferred by farm owners as a way to ensure both public conservation goals and farmland goals (Dubois, 2013, p. 85). Selling development rights was preferred to achieve preservation goals (67% agree) but only 21% were willing to sell developments rights on their own land.

This study found that the limitations to farming were perceived to be primarily agricultural infrastructure, regulations, and socioeconomic issues. Recommendations to Thurston County from the results of this study included: to continue the current use (Open Space) tax program for agriculture (and other economic incentives); support for cluster development and planned rural resource development; support for Conservation Futures and keeping farmland large (un-fragmented); and strong support for the Purchase of Development Rights program (Dubois, 2013).

1.3.2 Recommended Strategies for Farmland Protection

The Working Lands Strategic Plan presented specific strategies to conserve working lands and support the people who work them. The strategies were classified in four categories, which include: Working Lands Advocate, Economic Sustainability, Regulatory and Political, and Education and Outreach. Some of these strategies have been implemented such as the institution of an on-going Purchase of Development Rights Program (PDR), which was also included in the Comprehensive Plan. The first priority level strategies that have not yet been fully implemented include:

- *Thurston County should take the lead in creating a position for a Working Lands Advocate; this person would have the primary staff role for carrying out the strategies identified in the Strategic Plan. (Working Lands Advocate Strategy)*
    - The Working Lands Strategic Plan argues that working lands in Thurston County might be stronger if a position such as this had been in place historically. This position was envisioned to not only provide a point of contact with the County government for gathering information and helping to identify the resources available and appropriate contacts; but would also have more of an advocacy type of role to ensure that groups and individuals in the agricultural community were notified of relevant issues and make sure they had sufficient information to recommend or decide a course of action. This position would act as a bridge and provide an important communication link between working lands constituencies and other groups, ensuring that working lands are visible and considered in relevant activities and decision-making.
    - Three models were presented by the Thurston County Agricultural Advisory Committee for the location of this position: 1) Located at the County in the Board of County Commissioner's Office, or 2) in the Resource Stewardship planning department. The advantages to these locations were described as the high level of visibility and proximity to decision-making, as well as the information and resources available at the County offices. 3) Centrally located in an agency that is involved with working lands such as the

Thurston Conservation District or Washington State University Extension Service, and funded by multiple sources. The advantages of this location included that the position is at an "arm's length" from the County and would have different funding sources, although the disadvantage is being outside the decision-making structure of the County government.

  - On May 28th 2015 the Agricultural Advisory Committee took a vote and came to consensus that option 3 was the preferred model for location of this position. The Committee also agreed that, regardless of how this position is funded or where it is located, this position is critical and needs to be filled as soon as possible.

- *Thurston County should give particular attention and assistance through transitional planning for the next generation of farmers and family forest owners in implementing these strategies as well as addressing other factors that may cause barriers. (Economic Sustainability)*
  - This strategy focuses on people entering the working lands economic sector (i.e. new farmers and family forest owners). Innovative approaches, such as the FarmLink program, which provides a way to connect those wanting to enter the field and those who are ready to leave. Federal agencies, such as the Farm Service Agency and Farm Loan Programs also provide funds for beginning and small farmers.
- *Thurston County should investigate fees that are applied to working lands and identify ones that should be eliminated or modified. (Regulatory and Political Strategy)*
  - One example is the current stormwater fee. It is argued that working lands sometimes mitigate stormwater by providing areas for floodwater retention, rather than contribute to stormwater runoff. If this is the case, working lands could be given a tax credit for the services provided.
- *Thurston County should review relevant codes to determine alternative standards for working lands that would still protect public and workplace safety. (Regulatory and Political Strategy)*
  - A review of various County Codes should be completed to determine if commercial or urban standards are being applied to working lands structures or uses. The review of policies should define more clearly the difference and look at fully or partially exempting agricultural structures and have a wide range of fees that are assessed.
- *Thurston County should investigate the types of problems that might arise with the complexity of multiple applications and propose a solution that would address the problem the goal is to review working lands applications in a cohesive, comprehensive way. (Regulatory and Political Strategy)*
  - Continue streamlining the process for multiple applications to different County departments.
- *Thurston County should strengthen its Transfer of Development Rights (TDR) component through education about what it can achieve and by providing technical advice for sending area owners who want to pursue a transfer of development rights. Thurston County should take the lead working with urban jurisdictions in the county to develop a robust TDR market and clearly*

defined process. This initiative should also include educational programs and technical advice for cities and those in receiving areas. (Regulatory and Political Strategy)

- *Thurston County should research and explore the use of mitigation as a tool to off-set the conversion of lands to urban uses. Inclusion in the comprehensive plan should be encouraged. (Regulatory and Political Strategy)*
    - The conceptual base for this strategy is similar to wetland mitigation. In this case, when development or conversion affects working lands a cost is incurred. The cost can be addressed in multiple ways, such as cash compensation or providing other comparable working lands sites. This could also be instituted similarly to wetland banking. Mitigation measures could be applied not only to development in agricultural areas, but could also be applied when growth boundaries are being expanded. For example, a city or developer would be required to buy development rights to offset growth into a previously rural area, which could then be banked until used in a designated receiving area.

The Working Lands Strategic Plan acknowledged that funding for implementation of these strategies is critical. Sources were identified and included, but were not limited to: the County budget, Conservation Futures allocations, Open Space Withdrawal Penalty funds, forest excise taxes, a ballot bond issue, and grants. It was also suggested that collaborative funding should be explored to implement these strategies and support working lands and those who work them as they are and will remain essential components and contributors to the environmental quality, social fabric, and healthy economy of Thurston County.

The priority strategies for enhancing economic development that were identified in the study done by the Pacific Mountain Workforce Development Council (PMWDC) included to: protect the viability and productivity of food production; develop a food safety/food security initiative; ensure balance in critical areas rules to protect producers; identify potential local opportunities and develop a stop-leakage strategy targeting dependence on external supplies; help market local food; and provide policy advocacy and technical assistance for food suppliers.

Implementing the PMWDC strategies involves close collaboration between regional leaders, decision-makers, and stakeholders to determine a mutually beneficial path and to encourage initiatives that support local economic growth. As a collaborative program that involves a diversity of organizations, regional leaders, and stakeholders in the decision-making process, the VSP Workgroup is in a unique position to take these strategies into consideration for implementation and to promote maintaining and improving the economic viability of agriculture.

The Thurston Thrives program formed a collaborative strategy to address the challenges and opportunities related to local food systems within the Thurston region by forming a local food system panel from a broad representation of community leaders and others active in food production and distribution. This panel examined food system related issues and provided recommendations for meeting current and future food needs.

The panel defined a local food system as, “the ways that the people of the Thurston Region grow, produce, process, distribute, access, consume, and dispose of food” (Sustainable Thurston, 2012, p. 4). The panel discussed objectives and strategies of a sustainable local food system, including that it would:

- Support a stable base of family farms that use production practices that are less chemical and energy-intensive, and emphasize local outputs;
- Create and foster food and agricultural policies that promote local food production, processing, and consumption wherever possible;
- Foster a business environment where food, community food enterprises and agriculture-related business can create jobs, recirculate financial capital within the community, and contribute to diversifying our community’s economic development;
- Develop marketing and processing practices that create more direct and beneficial links between producers and consumers, and reduces resources needed to move food;
- Improve access to fresh foods; manage costs;
- Educate on all aspects of food – from soil to soil;
- Work to reduce waste through education about efficient and safe home and institutional meal planning, purchasing and storing;
- Support efforts that make use of waste food as food and when it becomes waste, recover and compost at the home and industrial levels, using compost to enrich soils;
- Improve access by all community members to a culturally appropriate, adequate, healthy, affordable food;
- Improve working and living conditions for farm labor such that farmers and farm workers can be full contributing members of the community; and,
- Eliminate food insecurity with a coordinated system of service delivery.

The American Farmland Trust study also provided recommended strategies for Thurston County and opportunities for improvement to better protect farmland, which included the rezoning of land surrounding LTA designation to Rural 20 and Rural 10 zones rather than RRR 1/5 in order to better buffer these areas from development pressures. They also recommended increasing the CFT rate to the maximum of 6.25-cents per $1000 dollars of assessed value, with the additional funding being allocated specifically to farmland purchase of development rights. As of 2012 Thurston County property tax payers paid 5.06-cents per $1,000 assessed value. The levy is subject to the statutory limit of 1% per year. In 2011, the Commissioners made important changes in how the Conservation Futures Program is managed. The Program now operates as an annual grant program and the funding is budgeted annually by the Thurston County Board of County Commissioners.

The primary recommendations for farmland protection from the AFT study were to:

- Include all viable farmland in agricultural zones
- Improve the protections provided within agricultural zones (i.e. increasing minimum lot sizes and narrowing allowable uses)

- Purchase (or otherwise secure) development rights for critical farmland parcels
- Provide property tax relief to all qualifying farmland
- Provide economic and regulatory assistance to farmers

The last recommendation from AFT (which is currently supported by the Agricultural Advisory Committee and the VSP Workgroup) was to have a position dedicated as liaison to the agricultural community. The Thurston County Working Lands Strategic Plan drafted by the Agricultural Advisory Committee in 2010 also provided support for this idea in the recommendation to create a Working Lands Advocate position. This position was seen as a priority for the County to provide a staff person that will be able to hear and act on farmers needs and provide support and information regarding agricultural preservation. An agricultural liaison position was also recommended by the VSP Workgroup and stakeholders involved in the process as an important component to the program's implementation and monitoring activities.

1.3.3 Status of Farmland Protection

To encourage the protection of agricultural lands, Thurston County has implemented a variety of strategies, including: the establishment of zoning regulations meant to support farmers; the preservation of some lands from intense development through land use designations such as low density zoning (Rural 1 dwelling unit per 10 acres and Rural 1 dwelling unit per 20 acres); long-term agricultural (LTA) zoned areas; the transfer and purchase of development rights; and the economic support of some landowners through programs such as the Open Space Tax Program that provides tax breaks for the preservation of natural resource lands.

Properties enrolled in the Open Space Tax Program are valued at their current land use rather than their "highest and best" use. Agricultural landowners who voluntarily commit to continuing these uses may apply for current use classification, which results in significant property tax savings and helps reduce pressures to convert farmland. In 1970 Washington State Legislature adopted the Open Space Tax Act to ". . . maintain, preserve, conserve, and otherwise continue in existence adequate open space lands for the production of food, fiber, and forest crops, and to assure the use and enjoyment of natural resources and scenic beauty for the economic and social well-being of the state and its citizens." The Legislature recognized that the market value of land used for farming, timber production or open space uses is often much lower than its market value for other "higher" uses, like residences or businesses. Since property taxes must be based on the "highest and best" use under state law, owners of farmland or open space often have difficulty continuing their "natural resource" uses while paying "higher" use taxes. Land-owners often find that in order to remain economically viable they have to convert their land to the "higher" uses. This reduces the overall supply of farmlands, forest lands, and open space. In order to address that problem, the Legislature provided a way for County Assessors to base property tax assessments on the "current use value" of lands used for natural resource production or protection.

In 2011, approximately 35,152 acres of agricultural lands were enrolled in the Thurston County Assessor's Agriculture Open Space Tax program, which decreased to 33,882 in 2016[5]. Overall, land enrolled in the Open Space Tax Program has decreased from approximately 40,446 acres in 2011 enrolled in both the Assessor's Open Space—Farm and Agriculture program (35,152 acres) and the Board of County Commissioner's Open Space—Open Space program (5,299 acres) to approximately 38,330 acres in 2016, with 33,882 acres in the Assessor's Program and 4,448 acres in the Board of County Commissioner's Program. In 2011, approximately 32%[6] of the total acres of agricultural activities were enrolled in Thurston County's Open Space Farm and Agriculture program.

The amount of agricultural land designated as LTA and NA in 2011 was 15,916 acres. This number has decreased to 15,878 acres as of 2016. The VSP agricultural activities mapping found a total of approximately 125,618 acres in Thurston County in 2011. The percentage of land protected in LTA zoning was approximately 13% of the estimated total acres of agricultural activities in 2011.[7]

Table 2. Baseline Acreage and Current Status of Designated Agricultural Lands

Farmland Protection Program	2011 Baseline (acres)	Percent of Total Ag Activities	Current (2016 acres)
Assessor's Open-Space Farm and Ag Current Use	35,152	28 %	33,882
Commissioner's Open Space Farm and Ag Conservation Land	5,299	4 %	4,448
Total Open Space Farmland	***40,446***	***32 %***	***38,330***
Long Term and Nisqually Ag	15,916	13 %	15,878

Source: Thurston County Resource Stewardship Department and Thurston Regional Planning Council

The Conservation Futures Tax program also funds conservation easements and the purchase and transfer of development rights for the protection of farmland in Thurston County. To date, approximately 2,421 acres of agricultural land have been protected with conservation easements, acquisition, and the purchase and transfer of development rights using CFT funds. There is also an additional estimated 1,013 acres of agricultural lands that are in the process of receiving CFT funding for the protection of agricultural use and wildlife habitat, including riparian areas, oak woodlands, and prairie.[8]

[5] This data uses July 1, 2011 parcel data and June 2016 parcel data, retrieved from Thurston County Geodata.
[6] Percentages are calculated by dividing the baseline (as of 2011) acreage of farmland in protection programs by the baseline acreage of agricultural activities (125,618) from VSP mapping.
[7] There are 15,916 acres zoned LTA and NA in 2011 parcel data from March 17, 2011 (retrieved from Thurston County Geodata on 7/13/2016).
[8] Thurston County Resource Stewardship Department, *personal communication* (March 25, 2015).

The preservation of working farms is also accomplished through the efforts of various organizations dedicated to supporting local farmers and funding for farmland preservation is provided in numerous ways, including state funded programs. In 2005, the Washington State Legislature established a statewide farmland preservation program within the Washington Wildlife Recreation Program (WWRP), which is administered by the Recreation and Conservation Office (RCO) and funded from the State's Capital Construction budget. The farmland preservation grant program primarily provides funds for the purchase of development rights on farmlands to protect the land from development pressures and for long-term protection to ensure the land is available for farming in the future. Farmland preservation projects include land acquisition, enhancement or restoration, combination of acquisition and restoration, and farm stewardship plans. Enhancement activities must improve the ecological functions of the farmland through activities that include: installing fences to keep livestock out of riparian areas, replanting native vegetation on erosion-prone land along streams, restoring historic water run-off patterns, improving irrigation efficiency, and installing solar well pumps.

Several Washington Wildlife Recreation Program (WWRP) farmland preservation grants were awarded in Thurston County in 2014. The Heernett Environmental Foundation and the South of the Sound Community Farmland Trust received $234,000 from the WWRP and $450,000 from CFT for conserving the Schweikert Farm along the Chehalis River. The Heernett Environmental Foundation, in collaboration with other organizations, will use the funds to buy a 113-acre farm along the Chehalis River and Scatter Creek in South Thurston County, conserving 27 acres of active floodplain reaches and protecting habitat for coho and chum salmon as well as cutthroat trout. The property has a high level of productive habitat and ground water connectivity and is adjacent to 48 acres of land that is already conserved for salmon and wildlife habitat. Conserving more than a quarter-mile of the Chehalis River and a half-mile of Scatter Creek, this project is a great example and will provide many long-term beneficial ecosystem functions as well as benefits to the community on what is planned to be a working educational farm.

1.4 Background on Critical Areas Protection

In the 1980s, Thurston County and the City of Olympia adopted "Environmentally Sensitive Areas" regulations for streams and wetlands. By the early 1990s, the state's Growth Management Act directed local governments to adopt Critical Area Ordinance regulations to protect critical areas, including wetlands and stream corridors, in balance with managing growth. Thurston County adopted their first Critical Areas Ordinance in 1993. In 1995, the state amended the Growth Management Act to require counties and cities to include the "best available science" in developing policies and development regulations to protect the functions and values of critical areas.

The Thurston County Critical Areas Ordinance addresses the following types of critical areas: critical aquifer recharge areas; geologic hazard areas; seismic hazard areas; volcanic hazard areas; mine hazard areas; frequently flooded areas (including channel migration zones); fish and wildlife habitat conservation areas; and wetlands. Regulations protecting Critical Areas are listed in Thurston County Code (TCC) Title 24, which was last updated in July, 2012.

Conflicts surrounding the protection and enhancement of environmentally critical areas on agricultural lands under Washington's Growth Management Act (GMA) have resulted in years of legal review. Washington State's Voluntary Stewardship Program (VSP) resulted from a collaborative effort with the Ruckelshaus Center, a process commissioned by the state Legislature to examine the relationship between agricultural uses and critical area regulation. The VSP provides an alternative approach for counties to address Growth Management requirements to protect critical areas on agricultural lands. Instead of enacting further critical areas regulation for agricultural activities, the VSP allows agricultural operators to develop voluntary, site-specific stewardship plans for the protection and enhancement of both critical areas and the long-term viability of agriculture.

A local natural resource based economy relies on healthy functioning ecosystems and the services and benefits those ecosystems provide. In 2012, Earth Economics defined and estimated the monetary value of Thurston County's natural capital as a tool to inform public policy, local land use planning, and enhance management and conservation goals, as well as support efforts to create a strong local economy and a high quality of life for residents. This study found through the initial rapid evaluation that Thurston County ecosystems provide between $608 million and $6.1 billion in economic benefits to the regional economy every year (Earth Economics, 2012). This study suggests that valuing ecosystem services can be used to improve natural resource management in Thurston County and it can provide governments, organizations, and private owners a way to calculate the rate of return on conservation and restoration investments. Each land cover type in Thurston County, from coastal lowlands to prairie to agricultural lands, was found to provide a wide variety of ecosystem services and benefits.

1.4.1 Critical Areas Context in Thurston County

Critical Areas include the following areas and ecosystems: wetlands, critical aquifer recharge areas, fish and wildlife habitat conservation areas, frequently flooded areas, and geologically hazardous areas.

Critical aquifer recharge areas are areas with a critical recharging effect on aquifers used for potable water, including areas where an aquifer that is a source of drinking water is vulnerable to contamination that would affect the potability of the water, or is susceptible to reduced recharge. Most of Thurston County lands are categorized as a critical aquifer recharge area, either of extreme, high, or moderate sensitivity. The Nisqually and Deschutes watersheds are mostly categorized as extreme sensitivity; the Chehalis watershed is categorized as extreme sensitivity surrounding the main riverbeds, and is otherwise generally moderate sensitivity. The Kennedy-Goldsborough watershed is primarily moderate sensitivity. Areas that are not mapped include just west of Alder Lake in WRIA 11, surrounding Bucoda and east of Grand Mound south of the Skookumchuck River, and south of the Chehalis River in WRIA 23.

Fish and wildlife habitat conservation areas are areas that serve a critical role in sustaining needed habitats and species for the functional integrity of the ecosystem. These areas include oak stands and native grasslands, Washington Natural Heritage Program (WNHP) data, gopher and prairie soils, and priority habitat species areas.

Thurston County experiences many types of flooding, including river flooding and groundwater flooding. River flooding is most common along the major rivers of the Nisqually, Deschutes, Skookumchuck, Black and Chehalis River. Frequently flooded areas are lands that lie in a flood plain and are at a 1% greater risk of flooding in any given year within the highest known recorded flood elevation. These areas primarily exist around streams, rivers, lakes, coastal areas, wetlands, and areas with high groundwater. Mapped areas include along the Nisqually River and the Nisqually Reach in WRIA 11; along the Deschutes River in WRIA 13, along the Chehalis, Skookumchuck, and Black Rivers in the WRIA 23; and along portions of Kennedy Creek in WRIA 14. Other areas are scattered throughout the County. Floodplains and adjacent waters play an important role to managing flooding in the County. Some benefits, such as aesthetics and landscape, are constant. Floodplains also actively play a role in reducing the number and severity of floods. Natural, undeveloped and vegetated floodplains can reduce the force, height and volume of floodwaters, allowing floodwaters to spread horizontally. Floodplains also play an important role in improving water quality by slowing stormwater runoff and reducing nonpoint pollution.

Geologically hazardous areas are areas that are susceptible to erosion, sliding, earthquake, or other geologic events. Areas within the County are vulnerable to naturally occurring geologic events, such as landslides, lahar flows, and earthquakes. Steep slopes with a percentage grade >40% exist mostly in the southeastern portion of the County, in some southern areas of the Chehalis watershed, and in the Black Hills within the Chehalis and Kennedy-Goldsborough watersheds. Other areas exist scattered throughout the County and along the marine shoreline.

Wetlands are areas that are inundated or saturated by surface water or groundwater at a frequency to support vegetation typically adapted for saturated soil conditions. Wetlands are useful in preventing flooding and erosion by absorbing floodwater and sending it slowly to rivers, streams and aquifers. Wetlands also act as a natural cleanser and filter out pollutants, including nitrogen and phosphorus. Wetlands are mapped throughout Thurston County, primarily along major streams and their tributaries, as well as along Totten, Eld, Budd, and Henderson Inlets.

1.4.2 Status of Voluntary Critical Areas Protection

Voluntary stewardship activities are already being implemented by various organizations and programs throughout Thurston County, including Watershed Planning Units, the Puget Sound Salmon Recovery Plan, Department of Ecology's Water Quality Program, Thurston County Resource Stewardship Department, Thurston Conservation District, USDA Natural Resources Conservation Service (NRCS), and Thurston Regional Planning Council, as well as individual landowners. See Section 1.5 for more information on the 2011 baseline conditions of critical areas related to the intersection with agricultural activities.

Currently, the Department of Ecology works with the Thurston Conservation District (TCD) in addressing agricultural pollution problems. The steps typically are:

1. Ecology receives an agricultural pollution complaint, then verifies whether the complaint is valid or not. If a pollution problem is verified, the farm is referred to the TCD for assistance. If the problem is an immediate or substantial threat, Ecology is committed to require immediate corrective action that will stop the pollution discharge.
2. Usually, the farmer, working with the TCD, has up to six months to develop a farm plan and an additional 18 months to implement the plan.
3. If the farmer chooses not to work cooperatively with Ecology or the TCD, Ecology will take appropriate action, which may include formal enforcement.

Thurston County's Environmental Health Codes for nonpoint source pollution has a similar strategy for addressing pollution problems and violations. If a compliance officer has reasonable cause to believe that a violation has occurred the officer notifies the responsible person by telephone, mail, or in person. The responsible person is given 15 days to seek technical assistance (TCD) and to begin planning and implementing corrective measures. If a conservation plan is required it shall be approved within six months of the notification, and implementation shall occur within 12 months of plan approval.

If a farm operator has an approved conservation plan with the TCD, which is being implemented and maintained as scheduled, they are exempt from the practices and procedures in section 4.2 of the Thurston County Environmental Health Codes rules and regulations for nonpoint source pollution (Thurston County, 1994).

A reliable and repeatable source of information to track efforts that both protect critical areas and improve the viability of agriculture comes from NRCS and the conservation practices implemented each year. Both NRCS and the Thurston Conservation District track activities by conservation practice and maintain confidentiality of detailed information. The implementation of conservation practices could result in changes to baseline conditions of critical areas at a site or watershed scale. The conservation practices implemented (Appendix C section 2.1) since the 2011 baseline demonstrate progress of protection and enhancement actions related to the VSP goals for critical areas and agricultural activities in Thurston County.

1.5 Thurston County Baseline Conditions

The effective date of the VSP legislation is July 22, 2011. This is the statutory date for identifying the applicable baseline for county requirements related to protecting a particular critical area, and for maintaining and enhancing agricultural viability. This baseline also delineates the assessment line between critical area protection and voluntary enhancement that may be promoted where needed, through incentive-based measures, to improve critical area functions and values above the July 22, 2011 protection baseline. (RCW 36.70A.703)

This is also the date from which the County will measure progress in implementing the Work Plan measurable benchmarks. VSP programmatic assessments should occur at the watershed scale (not farm by farm or parcel by parcel), as all VSP participation by agricultural operators is voluntary. "Program

shall be *designed to* protect and enhance critical areas *on lands used for agricultural activities through voluntary actions by agricultural operators*." (RCW 36.70A.705(1))

> *Create measurable benchmarks that, within ten years after the receipt of funding, are designed to result in (i) the protection of critical area functions and values and (ii) the enhancement of critical area functions and values through voluntary, incentive-based measures. (RCW 36.70A.720(1)(e))*
>
> *Establish baseline monitoring for: (i) Participation activities and implementation of the voluntary stewardship plans and projects; (ii) stewardship activities; and (iii) the effects on critical areas and agriculture relevant to the protection and enhancement benchmarks developed for the watershed. (RCW 36.70A.720 (1)(i))*

If voluntary critical area protection or enhancement projects, or agricultural viability efforts, have been implemented since July 22, 2011, the VSP Workgroup can include these in their monitoring of progress towards protection and enhancement benchmarks. This can help the County meet its statutory obligation to protect critical areas while maintaining agricultural viability and keep the aggregate level of critical area protection from degrading below the July 22, 2011 VSP protection baseline.

1.5.1 Intersection: Agricultural Activities and Critical Areas

In order to establish 2011 aggregate or watershed baseline monitoring of critical areas and agriculture activities within the watershed, an inventory of agriculture and critical area resources was conducted. Due to the general nature of the definition for agricultural activities, the extent had not previously been mapped. In mapping agricultural activities, a variety of data sources were used in an attempt to understand not only the designated agricultural lands in Thurston County (as previously mapped) but the overall estimated areas with agricultural activities, as defined in the VSP statute RCW 90.58.065.

Data Sources for Agriculture

Agriculture extent was determined by combining (through an additive process, i.e. using everything classified as agriculture in at least one source): National Agricultural Statistics Service (NASS) Cropscape data from 2011; USGS GAP land cover data from 2011; National Land Cover Database (NLCD) 2011 land cover data; windshield survey and mailing lists from the Thurston Conservation District; and Thurston County parcel data. Grassland data from the NASS Cropscape layer was deemed to be too broad to consider strictly agriculture and was excluded. See Appendix F for the VSP map of estimated agricultural activities in Thurston County.

Data Sources for Critical Areas

The critical areas in Thurston County were previously mapped for VSP based on data from the 2012 CAO update,[9] however additional sources of data were used to map the intersection of agriculture and critical areas. This may result in differences between the areas mapped previously and the areas mapped for intersection. See Appendix G for the VSP maps of the intersection of each critical area with the estimated agricultural activities.

The Wildlife Habitat Conservation extent was determined through a combination of prairie- and Mazama Pocket Gopher-associated soils (from Thurston County Geodata), Washington Department of Natural Resources (WaDNR) Oak stand, high-quality habitat, and native and non-native grassland data, and Washington Department of Fish Wildlife (WDFW) Priority Habitat Species (PHS) areas. Geologic Hazard Area data used a pre-classified slope stability layer from WaDNR, using areas with moderate or high slope stability risks. Critical Aquifer Recharge Area data came from Thurston County Geodata. Wetlands data was also sourced from Thurston County Geodata. Flood zone data was sourced from the Federal Emergency Management Agency (FEMA).

Table 4 approximates the baseline acreage of critical areas intersecting with agricultural activities in each watershed in Thurston County.

Table 4. Intersection of Agricultural Activities and Critical Areas

The data below serves as a general indicator and is meant to be confirmed by the technical assistance provider on-site to verify the presence of Critical Areas in areas of agricultural activities. This data may change between reporting periods due to factors outside the scope of VSP and will not be used to determine if a benchmark has been met or not. It will be an ongoing process as a part of the VSP work plan implementation to ground-truth the areas of intersection through site visits during the development of Stewardship Plans with the technical assistance provider and individual agricultural operators.

Table 4A. Thurston County Intersection of Agricultural Activities and Critical Areas

Critical Area	Thurston County Intersection Acreage	Percentage of Critical Area that Intersects with Ag Activities[1]
Agricultural Activities	*125,618*	
Wildlife Habitat Conservation Areas[1]	**82,848**	**66 %**
Oak & Grasslands	6,415	5 %
WNHP	14,061	11 %
Prairie Soils	48,068	38 %
Gopher Soils	63,129	50 %
Priority Habitat Species Areas	30,173	24 %

[9] For VSP Maps of critical areas visit the Thurston County website at http://www.co.thurston.wa.us/planning/vsp/voluntary-stewardship-maps.html

Geologic Hazard Areas	**12,197**	**10 %**
Critical Aquifer Recharge Areas	**106,916**	**85 %**
Category 1 – Extreme Sensitivity	78,313	62 %
Category 2 – High Sensitivity	13,003	10 %
Category 3 – Moderate Sensitivity	15,599	12 %
Frequently Flooded Areas (FEMA Flood Zones)[1]	**26,464**	**21 %**
0.2% Annual Flood Chance (500-year flood)	2,390	2 %
1% Annual Flood Chance (100-year flood)	24,074	19 %
Wetlands	**15,511**	**12 %**

Table 4B. Chehalis Watershed Intersection of Agricultural Activities and Critical Areas

Critical Area	Chehalis Watershed Intersection Acreage	Percentage of Critical Area that Intersects with Ag Activities
Agricultural Activities	*62,241*	
Wildlife Habitat Conservation Areas	**42,661**	**69 %**
Oak & Grasslands	4,529	7 %
WNHP	11,678	19 %
Prairie Soils	25,529	41 %
Gopher Soils	32,052	51 %
Priority Habitat Species Areas	16,616	27 %
Geologic Hazard Areas	**5,654**	**9 %**
Critical Aquifer Recharge Areas	**52,498**	**84 %**
Category 1 – Extreme Sensitivity	43,647	70 %
Category 2 – High Sensitivity	4,243	7 %
Category 3 – Moderate Sensitivity	4,608	7 %
Frequently Flooded Areas (FEMA Flood Zones)	**12,203**	**20 %**
0.2% Annual Flood Chance	1,227	2 %
1% Annual Flood Chance	10,975	18 %
Wetlands	**8,679**	**14 %**

Table 4C. Deschutes Watershed Intersection of Agricultural Activities and Critical Areas

Critical Area	Deschutes Watershed Intersection Acreage	Percentage of Critical Area that Intersects with Ag Activities
Agricultural Activities	*30,900*	

Wildlife Habitat Conservation Areas	**18,053**	**58 %**
Oak & Grasslands	1,099	4 %
WNHP	1,524	5 %
Prairie Soils	11,305	37 %
Gopher Soils	14,682	48 %
Priority Habitat Species Areas	3,814	12 %
Geologic Hazard Areas	**2,088**	**7 %**
Critical Aquifer Recharge Areas	**26,943**	**87 %**
Category 1 – Extreme Sensitivity	16,163	52 %
Category 2 – High Sensitivity	6,136	20 %
Category 3 – Moderate Sensitivity	4,644	15 %
Frequently Flooded Areas (FEMA Flood Zones)	**6,426**	**21 %**
0.2% Annual Flood Chance	209	1 %
1% Annual Flood Chance	6,216	20 %
Wetlands	**3,476**	**11 %**

Table 4D. Nisqually Watershed Intersection of Agricultural Activities and Critical Areas

Critical Area	Nisqually Watershed Intersection Acreage	Percentage of Critical Area that Intersects with Ag Activities
Agricultural Activities	*26,001*	
Wildlife Habitat Conservation Areas	**22,092**	**85 %**
Oak & Grasslands	786	3 %
WNHP	859	3 %
Prairie Soils	11,192	43 %
Gopher Soils	16,394	63 %
Priority Habitat Species Areas	9,741	37 %
Geologic Hazard Areas	**4,224**	**16 %**
Critical Aquifer Recharge Areas	**25,928**	**99 %**
Category 1 – Extreme Sensitivity	18,342	71 %
Category 2 – High Sensitivity	2,252	9 %
Category 3 – Moderate Sensitivity	5,333	21 %
Frequently Flooded Areas (FEMA Flood Zones)	**2,913**	**11 %**
0.2% Annual Flood Chance	1,970	8 %
1% Annual Flood Chance	953	4 %
Wetlands	**3,163**	**12 %**

Table 4E. Kennedy-Goldsborough Watershed Intersection of Agricultural Activities and Critical Areas

Critical Area	Kennedy-Goldsborough Watershed Intersection Acreage	Percentage of Critical Area that Intersects with Ag Activities
Agricultural Activities	*6,476*	
Wildlife Habitat Conservation Areas	**42**	**1 %**
Oak & Grasslands	0	0 %
WNHP	0	0 %
Prairie Soils	39	1 %
Gopher Soils	0	0 %
Priority Habitat Species Areas	3	0 %
Geologic Hazard Areas	**231**	**4 %**
Critical Aquifer Recharge Areas	**1,547**	**24 %**
Category 1 – Extreme Sensitivity	*161*	*2 %*
Category 2 – High Sensitivity	*371*	*6 %*
Category 3 – Moderate Sensitivity	*1,015*	*16 %*
Frequently Flooded Areas (FEMA Flood Zones)	**4,921**	**76 %**
0.2 % Annual Flood	*0*	*0 %*
1% Annual Flood	*4,921*	*76 %*
Wetlands	**194**	**3 %**

1.5.2 Agricultural Baseline Information

Other information for baseline conditions of agricultural activities include census data from the USDA National Agricultural Statistics Service (NASS), data from Thurston County, and Thurston Regional Planning Council. The 2012 agricultural census found 1,336 farms and 2,165 principal operators with an average age of 58.9 in Thurston County. The market value of agricultural products was $122,423,000 and 40 percent ($48,843,000) of that was from crops while 60 percent ($73,581,000) was from livestock.

Programs to protect farmland in Thurston County include the Open Space Tax Program, which provides current-use tax breaks, and zoning of Long Term Agriculture (LTA) and Nisqually Agriculture (NA). In 2011, approximately 35,152 acres of agricultural lands were enrolled as current use farm and agricultural land in the Assessor's Open Space Tax program and 5,299 acres of lands enrolled as farm and agricultural conservation land in the Board of County Commissioner's Open Space Tax program. The amount of agricultural land designated as LTA or NA in 2011 was 15,916 acres.

The 2011 VSP baseline found 125,618 acres of agricultural activities in Thurston County. The percentage of land protected in LTA or NA zoning was approximately 13% of the estimated total acres of farmland in

2011.[10] The percentage of agricultural land enrolled in the Open Space Tax Program was approximately 32% of the estimated total acres of farmland in 2011. See section 1.3 for more information on recommended farmland preservation strategies and the status of farmland protection (see Table 2).

[10] This data is collected using Thurston County Zoning layers. The baseline data for zoning is from 3/17/2011, and was obtained through Thurston County GeoData on 7/13/2016 through personal communication. The Current zoning data uses the most recent zoning layer as of 6/20/2016. Percentages are calculated using baseline agricultural activities (125,618 acres) for VSP mapping.

2 Overview of Study Areas

2.1 Chehalis Basin Overview

2.1.1 Geography and Hydrology

Thurston County incorporates 12% of the 2,520 square miles of the Chehalis Watershed. Thurston County contains only a small portion of the Lower Chehalis Watershed (WRIA 22), whereas nearly half (42%) of the County is located in the Upper Chehalis Watershed (WRIA 23) (Thurston County, 2013). The Chehalis River travels approximately 125 miles north-northwest and discharges through the Grays Harbor Estuary into the Pacific Ocean. The main tributaries of the Chehalis in Thurston County are the Skookumchuck and Black Rivers. Smaller creeks and tributaries include Scatter, Dempsey, Salmon, Waddell, Beaver, Mima, Cedar, Sherman, Prairie, North Fork Porter, Johnson, and Thompson (Skookumchuck) Creeks.

Due to the lack of significant snowpack in the upper watersheds of the Chehalis Basin, its streams and tributaries rely almost entirely on groundwater storage of winter rainfall to maintain flows throughout the year. Both surficial and alluvial aquifers are found in the Chehalis Watershed. Surficial aquifer water systems occur between several to 100 feet below ground surface and are primarily located in the river valleys and upland prairies. Alluvial aquifers are shallower, occurring within 20 feet of the ground surface, and provide water for local farms, private residences, and public water systems.

Areas important for water delivery are areas with relatively higher precipitation, and rain-on-snow areas. The western boundary of WRIA 23 falls within the Black Hills, and contains large areas mapped as “rain-dominated zones” as well as areas of “rain-on-snow zones”. The highest levels of annual precipitation in Thurston County, up to 127 inches per year, occur within the Black Hills. The hills surrounding the upper reaches of the Skookumchuck River and Skookumchuck Lake also contain large areas mapped as “rain-dominated zones” as well as areas of “rain-on-snow zones”. Much of the precipitation that falls in the Black Hills and hills surrounding the Skookumchuck River runs off because of the impermeable basalt and andesite that dominates the landform (Thurston County, 2013).

Surface water flows and groundwater aquifers that both rely primarily on rainfall precipitation provide water for local residences, agricultural activities, fish hatcheries, and industrial uses. These “out of stream” uses are the largest, however there are also “in stream” water uses such as fish and wildlife needs that also rely on the quantity of surface water flows in the Chehalis River and its tributaries as well as other streams and wetlands within the watershed. Ground water and surface water flows are closely connected in the Chehalis Watershed, which means that groundwater withdrawals for out of stream uses impact in stream flows (Chehalis Basin Partnership, 2004). Areas with high permeability soils are important for recharge. High permeability soils typically associated with Vashon recessional outwash from the last glacial recession are found along all of the river valleys. They are extensive in the southwest corner of the county near the Chehalis River, Scatter Creek, and the Black River. Large areas of high permeability soils are also located between Beaver Creek and Black Lake.

The Chehalis River Basin also contains estuarine and tidal wetlands as well as forested, scrub-shrub, emergent, and riverine wetlands. These wetlands naturally help control the effects of flooding as they

serve retention and detention functions. Important areas for surface water storage are areas containing depressional, riverine and other wetlands, lakes, frequently flooded areas, including 100-year floodplain, and unconfined river channels. The area east of Black River between Scott Lake and Scatter Creek contains numerous wetlands. The Dempsey Creek area and the Black River also contain numerous wetlands. Depressional wetlands are extensive throughout the Black River and Dempsey Creek area, as well as east toward Pitman Lake. Depressional wetlands are also located in the headwater area of Scatter Creek, and around tributaries to the Skookumchuck River. The 100-year floodplain is very wide and extensive around the Black River, Dempsey Creek, the Chehalis River, the Skookumchuck River, and Scatter Creek.

2.1.2 Land Uses and Land Cover Estimates

The predominant land covers of the Chehalis Basin are Evergreen forest (33%), Scrub/shrub (17%), and mixed forest (10%). Most of the forested acres are privately owned. The public land ownership includes Capital State Forest and portions of Mt-Baker Snoqualmie and Olympic National Forests. High and medium intensity development is below 1% combined. Low intensity development is 3%. Agriculture is relatively high at approximately 11.5% with Pasture/Hay (9%) and cultivated crops (2.5%) (Thurston County, 2013). Impervious surfaces in the Chehalis River Basin were estimated at 3.4% in 2010 (Thurston County & Thurston Regional Planning Council, 2013).

In 2013, a report developed by Thurston County in partnership with Thurston Regional Planning Council analyzed future basin use and found that the Chehalis Basin will experience increased commercial and residential development in the Grand Mound and Rochester areas. It was also projected that this area may experience an increase in industrial development. Additionally, an increase to 4.1% impervious cover is estimated in the Thurston County portions of the Chehalis River Basin by 2035.

The low-lying valleys adjacent to the Chehalis River and its major tributaries are the primary areas for agricultural activity. Review of the 2011 aerials indicated that natural shoreline vegetation, associated habitat and occasionally water courses have been modified as a result of the agricultural practices within these areas. Urban and rural residential, commercial, and industrial land uses are primarily located around the Chehalis/Centralia areas.

A major determinant of the quality of water resources is the land use within the watershed. From a water resources perspective, the fact that the Chehalis Basin is primarily forestland is an advantage as it is the land use that generally provides the highest quality water resources. In general, agricultural is considered to have the second lowest impact and urban land use to have the highest impact on the quality of water resources (Chehalis Basin Partnership, 2004). Population and economic pressures tend to promote the conversion of forest and agricultural lands to more intensive uses. There are current strategies and policies that encourage preservation of agricultural lands and provide protection to water resources and critical areas in the Chehalis Basin. The Chehalis Basin Partnership's Watershed Management Plan recognizes that when water resources are properly managed they can be protected in the face of growth and land use changes (see Section 3).

2.1.3 Critical Areas

Critical Aquifer Recharge Areas

The most vulnerable critical aquifer recharge areas are primarily along the major rivers and tributaries in the Chehalis Watershed. The Scatter Creek Aquifer recharge area north of the Chehalis River along Scatter Creek and Old Highway 99 from near Grand Mound past Tenino to the south along Skookumchuck River is mostly category 1, extreme aquifer sensitivity area (as per TCC Ch 24). There are also large areas of category 1 aquifers along the Black River and its tributaries to the west. A mosaic of category 1, 2, and 3 aquifers make up the remaining area surrounding many tributaries of the Black River including Salmon Creek south of Tumwater.

The Scatter Creek Aquifer is considered a very vulnerable, rapidly moving groundwater system that is the sole source of water for more than 1,000 public water systems and single family wells (over 18,000 people). The area is transitioning from agricultural to rural residential. At times, groundwater nitrate levels in this area have been some of the highest in Thurston County, with some wells exceeding drinking water standards. Certain areas of the aquifer have been contaminated by industrial pollution sources and land uses in the past but policies and regulations that were put in place have helped to protect the groundwater resources. Since 2008 nitrate levels have dropped throughout the aquifer.

While the identification of specific contributions from individual pollution sources is very difficult, it is likely that the reduction in nitrate levels in the Scatter Creek Aquifer was primarily due to changes in agricultural practices (Thurston County Environmental Health Department, 2009). Significant strides in reducing potential contamination from agricultural activities were achieved in the last three decades. Manure piles were, and are, more commonly covered, manure tanks and lined lagoons to store animal waste have been constructed, and manure is more likely to be applied to fields at agronomic rates. Four dairies also went out of business further reducing the nitrate loading. In samples from October 2013 nitrates had risen in many wells and there were some unsatisfactory coliform bacteria samples. However, by March 2014 the nitrate levels were down again following the overall trend of decreasing nitrates in the Scatter Creek Aquifer. Groundwater samples from the aquifer currently meet drinking water standards, but still show detectable nitrate levels. The Thurston County Water Resources Division is partnering with Environmental Health to install and monitor 8 new groundwater monitoring wells that will enable hydrogeologists to more fully understand groundwater quality in the area.

The Thurston County Water Resources Monitoring Report for 2009-2010 and 2010-2011 water years identified major water quality issues for Scatter Creek including non-point source pollution from agriculture, septic systems, and rural residential land uses; habitat loss from sedimentation and reed canary grass infestations; lack of riparian vegetation in some areas; and nitrate and coliform bacteria contamination. In general, zoning, land use and health regulations have protected the aquifer from

nitrate and many other contaminants.[11] The Scatter Creek Aquifer Citizen's Advisory Committee provided recommendations for well siting and septic systems as well as data collection and a monitoring program. The Citizen's Committee also "believes that with proper information, education, and incentives, area residents will be good stewards and take action to protect the aquifer" (Scatter Creek Aquifer Citizen's Committee, 2014).

Wetlands

The area east of Black River between Scott Lake and Scatter Creek contains numerous wetlands. The Dempsey Creek area and the Black River also contain numerous wetlands. Depressional and riverine wetlands are extensive throughout the Black River and Dempsey Creek area, as well as east toward Pitman Lake. Depressional wetlands are also located in the headwater area of Scatter Creek, and around tributaries to the Skookumchuck River. The western and northern sides of Scott Lake appear to have lost depressional wetlands. Built environment adjacent to streams occurs near Littlerock along the Black River, along Beaver Creek near the railroad and Interstate 5, along the Chehalis River close to Grand Mound, and in places along Scatter Creek due to rural development.

Geologic Hazard Areas

Sediment delivery via mass wasting (slope failure such as slides, flows, and falls) occurs in high mass wasting hazard areas and landslide areas in the Chehalis basin. Landslide areas are mapped in the headwater areas of the Skookumchuck River and around Skookumchuck Lake. Very limited, small locations of high mass wasting hazard areas are mapped in the Black Hills, south of the Chehalis River, east of Grand Mound, in the hills east of Tenino, and in the hills around the Skookumchuck River.

Process intensive areas for sediment delivery are areas of surface erosion, mass wasting, and in-channel erosion. Sediment delivery via surface erosion occurs in areas with steep slopes and erodible soils. Concentrations of these areas are located east of Waddell Creek, and east of Sherman Creek, along the upper reaches of the Skookumchuck River (upstream of Skookumchuck Lake), extending north around the headwaters of Scatter Creek.

Frequently Flooded Areas

The 100-year flood plains are mapped on the Voluntary Stewardship Program Critical Area maps. The 100-year floodplain is very wide and extensive around the Black River, Dempsey Creek, the Chehalis River, the Skookumchuck River, and Scatter Creek. It is also extensive along Waddell Creek, Mima Creek, Johnson Creek, Thompson Creek (Skookumchuck) Allen Creek, Beaver Creek, Bloom's Ditch and Salmon Creek. Unconfined river channels are found along the Black River, Dempsey Creek, Beaver Creek, Allen Creek, Mima Creek, the Chehalis River, Scatter Creek, the Skookumchuck River, Johnson Creek, and

[11] For more information on the Scatter Creek Aquifer visit http://www.co.thurston.wa.us/health/ehsc/studies.html

Thompson Creek (Skookumchuck). Vertical and lateral flows may be impaired by roads, ditches, and culverts. The major roads in WRIA 23 include Interstate 5, US Highway 12, and State Highway 507. WRIA 23 also contains several railroad tracks. Roads are most concentrated in the Rochester/Grand Mound area, the towns of Tenino and Bucoda, and around the Tumwater UGA. Capitol Forest contains numerous roads. The hills east and south of Skookumchuck Lake contain infrequent private logging roads. Culverts are concentrated in the low elevation areas of WRIA 23.

Discharge may be impaired by land cover with impervious surfaces and non-forested vegetation on areas with high permeability soils that intersect floodplains. Discharge may be impaired along the Chehalis River, the lower Black River, Scatter Creek, the Skookumchuck River (downstream of the dam) and Beaver Creek (Thurston County, 2013).

Fish and Wildlife Habitat Conservation Areas

Important fish habitat areas are primarily native fish and salmonid habitat. There are 31 salmonid stocks in the basin, 8 of which are known to be depressed and the status of 7 other stocks are unknown. Low summer flows and habitat degradation are the critical factors limiting the size of fish populations in nearly all Chehalis Basin streams (Chehalis Basin Partnership, 2004).

Important wildlife habitat conservation areas include many upland and prairie habitats. As the VSP critical area maps show, there are large areas in the Upper Chehalis Watershed with soils that are associated with prairie and Mazama pocket gopher habitat. One of the largest areas of gopher soils stretches from around Grand Mound and Little Rock Road east along Old Highway 99 towards Tenino and Skookumchuck River. There is also a patchy mosaic of prairie and gopher soils south of Tumwater and along Black River.

2.1.4 Agricultural Activities

The Chehalis Watershed within Thurston County contains extensive areas of agriculture, with approximately 62,241 acres of estimated agricultural activities. Areas zoned Long Term Agriculture are located along the western portion of the Black River, throughout the Chehalis River Valley, and along the Skookumchuck River between Bucoda and Skookumchuck Lake. In addition, many areas zoned Rural Residential Resource one dwelling unit per five acres (1/5) also contain agricultural uses. This zoning is extensive in the Chehalis Watershed. The Thurston County Farmland Inventory Report (2009) found that the majority of Thurston County's farmland was at risk of being converted to other uses, such as residential development, particularly when it is in the Rural Residential Resource 1/5 zoning. Nearly 50 percent of the 68,247 acres of farmland identified in the 2009 Farmland Inventory report for Thurston County were in the Upper Chehalis Watershed.

The primary agricultural activities in the Thurston County portions of the Chehalis Watershed include commercial dairy, livestock, and crop farming operations. The primary crops grown include hay and silage, with a relatively small amount of vegetables and grains. Berries are primarily grown in the Chehalis/Centralia area along with several Christmas tree farms. There are also several private

aquaculture facilities located in the Grand Mound/Rochester area. Other agricultural operations in the Chehalis Watershed include pasture and rangelands.

2.1.5 Intersection: Agriculture and Critical Areas

Agricultural activities are generally located in the low-lying valleys adjacent to the Chehalis River and its major tributaries and within or near frequently flooded areas. See section 1.1 for more detailed information on agriculture intersecting with critical areas in Thurston County. The 2009 Farmland Inventory Report found that an estimated 50% of the farmland in Thurston County contains, or is adjacent to, areas that provide important fish and wildlife habitat (Fisher & Mitchell, 2009). Agriculture intersecting with critical areas specific to the Chehalis watershed in Thurston County is analyzed in Table 5 below.

Table 5. Intersection of Agricultural Activities and Critical Areas with the Chehalis Watershed

Critical Area	Agricultural Activities Total Acreage	Percentage of Intersection
Total	*62,241*	--
Wildlife Habitat Conservation Areas	42,661	69 %
Geologic Hazard Areas	5,654	9 %
Critical Aquifer Recharge Areas	52,498	84 %
Frequently Flooded Areas (FEMA Flood Zones)	12,203	20 %
Wetlands	8,679	14 %

Furthermore, a recent study conducted jointly by the Washington State Department of Agriculture (WSDA) and the Washington State Department of Transportation (WSDOT) evaluated agricultural sites to determine if the Federally and State listed threatened Mazama pocket gophers are present in areas where a variety of agricultural operations are currently conducted within potential gopher habitat.

All or portions of six of the seven agricultural sites evaluated in the study were determined to have pocket gopher mounds present either within areas being managed, or immediately adjacent to current agricultural practices ranging from grazing to annual tillage. This indicates that Mazama pocket gophers are present within or adjacent to many of the areas where agricultural activities are currently being conducted in the Chehalis Watershed and throughout central to south Thurston County (Cook & Beale, 2014). Agricultural activities in the report represent a cross-section of those that currently exist in the central and southern areas of Thurston County. The data in this study was obtained jointly from the Thurston Conservation District and the 2013 WSDA crop geodatabase and include market crops (vegetable), grass hay, pumpkins, apples, pasture, Christmas trees, ornamental nursery, and a conifer seed orchard.

2.1.6 Existing Issues and Strategies

2.1.6.1 Water Quality

The streams and water bodies in the Chehalis Watershed have had a number of water quality violations that have placed them on the federal Clean Water Act 303(d) list of polluted waters for high levels of phosphorous and pesticides, high water temperatures, high levels of fecal coliform bacteria, turbidity, high pH, and low levels of dissolved oxygen (DO).[12] Waters on the water quality assessment and 303(d) list of polluted waters fall short of state surface water quality standards and are not expected to improve within the next two years. New water sampling indicates that some stream segments with 303(d) bacteria listings will move to category 1 (good quality) in the next assessment that is currently under review by Ecology. The changes are based on 2006-2009 data collected by the Chehalis Basin Partnership and include (within Thurston County): 2 listings on Beaver Creek, 3 on Black River, 1 on Cedar Creek, and 1 on Chehalis River.[13] However, there have not been changes to low DO or high temperature listings. Lower water quality is generally found in the larger tributaries and lower portions of the Chehalis River. Major water pollution concerns from agricultural operations include bacteria and nutrient pollution, and lower oxygen levels.

2.1.6.1.1 Current Strategies for Water Quality Issues

The primary strategies for protecting water quality and addressing high water temperature issues include, protecting and enhancing the riparian corridor, stabilizing stream banks, and increasing native vegetation cover. Water quality protection may also be accomplished by farm operators through measures that include, installing gutters and downspouts to prevent runoff from mixing with animal waste, maintaining proper stocking rates, maintaining proper pasture management practices, nutrient management, use of fencing, livestock paddocks, vegetative barriers and filter strips. Farm management systems are designed and built to collect, handle, transfer, and store manure, feed waste, silage leachate, and wastewater. See Appendix J for more information on conservation practices.

Class A dairies are regulated by Washington's Dairy Nutrient Management Act, RCW 90.64, and must have and implement a dairy nutrient management plan (DNMP). These plans are approved by the Conservation Districts.

The Department of Ecology's Total Maximum Daily Loads (TMDLs) set allocations for state waters that have been declared polluted and map out the path to restore these waters. The implementation process requires collaboration among agencies and local partners to institute strategies and water pollution controls (i.e. best management practices) for all identified sources.

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[12] For more information on the Department of Ecology's State of Washington, *"Water Quality Assessment and 303(d) list,"* (2012) visit http://www.ecy.wa.gov/programs/wq/303d/index.html.

[13] Department of Ecology Water Quality Program Personnel, *personal communication*, February 27, 2015.

The Chehalis Watershed TMDL Detailed Implementation Plan (2004) identifies voluntary practices that can help prevent pollution of water by dairy and other agricultural operations, including:

- Vegetated buffers to help reduce sediment, nutrient, bacteria, and organic matter inputs to watercourses and provide habitat.
- Pasture management for forage production as well as a soil cover/stabilizer.

The detailed implementation plan recognizes that water quality impacts from agriculture can be reduced or eliminated by additional practices that include: collection and proper storage of manure during winter, improving plant cover by careful livestock grazing management, appropriate revegetation of exposed soil surfaces, and protecting heavy-use areas from the effects of livestock trampling (Rountry, 2004).

Table 6. Summary of Water Quality Issues, Strategies and Actions in the Chehalis Watershed

Issues	Strategies/Objectives	Monitoring Plans or Recommendations	Implementation Status / Actions (highlights)
Water Quality			
Number of violations and areas listed for high levels of phosphorous, pesticides, and bacteria, high temp and pH, and low levels of DO	Protect and enhance the riparian corridor, stabilize stream banks, and increase plant cover and shade. Fence and vegetative "barriers" to prevent and reduce sediment and nutrient transport	Increased shade is the most important BMP to lower temperatures. Shoreline protections prevent or reduce transport of nutrient and help improve DO conditions	TMDLs in Upper Chehalis established allocations for bacteria, temp., and DO. Fecal coliform concentrations have been reduced significantly. Temperature and dissolved oxygen violations continue to be problematic

2.1.6.2 Water Quantity

Low summer flows and habitat degradation are the primary critical factors limiting the size of fish populations in nearly all Chehalis Basin streams (Chehalis Basin Partnership, 2004). The Chehalis Basin Watershed Management Plan (2004) reported that instream flows are not always met and that there may not be enough water to issue more water rights for out-of-stream uses, or to meet the needs of existing water rights users. The Watershed Management Plan and the Initial Watershed Assessment for the Upper Chehalis River (1995) both identified that there was an issue with the Department of Ecology over allocating water rights and claims within the Chehalis Basin. They also identified an issue with the discrepancy between the amount of water rights allocated and the quantity of ground and surface water actually being used. In order to ensure adequate water quantity, the Department of Ecology uses strategies such as the transfer of water rights and the closure of portions of the watershed to the issuance of new water rights.

However, the actual quantity of water that has been legally appropriated is impossible to quantify without an adjudication of water rights due to the large number of water right claims that have never

been evaluated. Furthermore, very few water users monitor their water use, which makes it difficult to determine how much water is actually used. Also, the timing of water use is rarely monitored or coordinated among users, making it more difficult to evaluate the impact of out-of-stream uses on the instream flows of the river system. Low summer instream flows have been shown to contribute to elevated water temperatures and low dissolved oxygen.

2.1.6.2.1 Future Concerns for Water Quantity – Climate Change

Additional demands on the water resources in the Chehalis Basin are likely to increase with the projected increase in human population and economic activity. The issue of adequate future water supply is further complicated by the issue of climate variability (i.e. climate change). There is little climate variability information available on a watershed scale and the future effects of climate change on water resources in the Chehalis Basin are still unclear. The Governor's Chehalis Flood Strategy Workgroup was tasked to recommend the next steps for reducing flood damage and enhancing aquatic species in the Chehalis River Basin. Their Aquatic Species Enhancement Plan (ASEP) released in 2014 included an analysis of climate change impacts on the Upper Chehalis Watershed salmonid populations. The ASEP climate change report used best available information from the UW Climate Impacts Group to address how climate change may affect species and how to select habitat restoration scenarios when taking climate change into consideration. Results of the alternative future conditions modeled for the climate change analysis showed changes in streamflow, including average monthly flow (wetter winters, drier summers), higher peak flows, and lower base flows (The Aquatic Species Enhancement Plan Technical Committee, 2014).

General outlines of the issues and projected effects from climate change are better defined at global and regional scales (Independent Scientific Advisory Board, 2007). Washington State's Integrated Climate Response Strategy (Department of Ecology, 2012) identifies several risks, including that the quantity and quality of water available for communities, irrigation, fish, hydropower generation, recreation, and other uses will be affected by declining snowpack, changes in seasonal streamflow, and increases in summer demand for water. The Climate Response Strategy also recognizes that farms and forests will be threatened by increased disease, pests, weeds, and fire, along with reduced summer water supplies.

2.1.6.2.2 Recommendations for Water Quantity Issues

In order to address water quantity issues, the Chehalis Basin Partnership recommends better water rights allocation and monitoring of water use, as well as developing mechanisms for sharing water that benefit all users. The Watershed Management Plan also recommends promoting basin-wide sustainable agriculture as a strategy to address issues with water quantity and moderating out-of-stream uses. As discussed earlier, it is also important to take the impacts of climate change into consideration when developing strategies to manage water quantity and selecting future conservation or restoration projects.

Table 7. Summary of Water Quantity Issues, Strategies and Actions in the Chehalis Watershed

Issues	Strategies/Objectives	Monitoring Plans or Recommendations	Implementation Status / Actions (highlights)
Water Quantity			
Instream flows are not always met, little monitoring of use. Quantity used unknown. Low summer instream flows have been shown to contribute to elevated temps and low DO. Climate Change analysis shows wetter winters, drier summers, higher peak flows, & lower base flows	Dept. of Ecology uses TWR and closes areas to new water rights. Monitor use. Develop mechanisms for sharing water that benefit all. Promote sustainable ag basin-wide. Take climate change into consideration when planning and selecting future projects	Chehalis WMP suggested better monitoring and water rights allocation. Develop groundwater/surface water model with the USGS and continue data collection. Feasibility work of an aquifer storage and recovery project. Restore stream flow, aquifer storage, ameliorate low flows and increase diversity	CBP working with the Dept. of Ecology. Submitted proposal to Ecology for ground/surface water model

2.1.6.3 Fish and Wildlife Habitat

The primary focus for fish habitat issues is on salmon and steelhead stocks in the Chehalis Basin and habitat factors that are limiting to salmonid recovery. The major habitat limiting factors are described in the Chehalis Basin Salmon and Steelhead Habitat Limiting Factors report (Smith & Wenger, 2001). The categories of habitat limiting factors include, loss of access to spawning and rearing habitat, floodplain conditions, streambed sediment conditions, riparian conditions, water quality, water quantity, estuarine and nearshore habitat, lake habitat, and biological processes. These categories overlap with each other and one habitat problem could impact more than one habitat limiting factor category.

2.1.6.3.1 Future Concerns for Fish and Wildlife Habitat – Climate Change

Climate change alone presents a major issue for aquatic species and will severely effect salmonid populations in the watershed, with the potential extirpation of spring-run Chinook populations primarily due to the sensitivity of this species to temperature changes (The Aquatic Species Enhancement Plan Technical Committee, 2014). However, the effects of riparian enhancement were also examined under alternative future conditions and enhancement had the largest beneficial effect on spring-run Chinook. Furthermore, the high riparian enhancement scenario increased abundance of all four species for both the low and high climate change scenarios. This suggests that, with a robust habitat restoration strategy, it may be possible to offset the impacts of climate change and improve salmonid populations in the Chehalis Watershed.

2.1.6.3.2 Priority Fish and Wildlife Habitat Concerns

The primary focus for terrestrial and upland wildlife habitat issues is on prairie species of concern, many of which are either currently listed under the Endangered Species Act (ESA) or are current candidates for listing. Some of these species include the Taylor's checkerspot butterfly, the Streaked horned lark, the Mazama pocket gopher, and the Oregon spotted frog. Much of the decline of these species can be attributed to habitat loss, with prairie being converted to other uses or lost to encroachment by trees,

nonnative grasses and invasive species such as Scot's broom. South Puget Sound prairies and oak woodlands were once sprawling grasslands that stretched for hundreds of miles. Though the region might be better known for its heavily wooded forests and glacial peaks, the grasslands, savannas and streams are home to rare species that can only be found in this unique region.

Prairies also provide clean water, because the prairie soils absorb and filter storm water that then replenishes drinking water aquifers. However, the permeable prairie soils are absorbing not only storm water, but run-off and pollutants, too. Now, less than ten percent of those prairies exist. Very little of that land is high quality prairie habitat, due to development, agricultural uses, and invasion of non-native species. A few of the larger prairies, like the Mima Mounds, can be seen easily, while others are scattered among forests, farms and houses. Plants and animals that once thrived, like the Taylor's checkerspot butterfly and Oregon white oak, are now threatened or endangered.[14]

Thurston County is currently working with the U.S. Fish and Wildlife Service (USFWS) on strategies to protect a variety of prairie species through the development of a Habitat Conservation Plan (HCP). The goal is a set of permanent protections that will provide long-term economic certainty, local land use control, and protection of prairie species for years to come. Another benefit of the HCP is that landowners won't have to worry about changing regulations because, with the help and input from the public, the plan will provide long-term certainty to individual landowners. The Endangered Species Act and other federal regulations remain applicable to all lands and are unchanged by the VSP. Section 4(d) of the Endangered Species Act allows for certain general activities on non-Federal agricultural and ranching lands. Ongoing agricultural activities are allowable (except for new practices), and may include: grazing; routine maintenance or construction of fencing; planting, harvest, fertilization, harrowing, tilling, or rotation (not a complete list).

Property owners are also subject to federal and state laws that provide protection of species listed as endangered or threatened. The presence of one or more prairie species does not necessarily have an impact on the landowner, especially if the landowner is not proposing any new development activities that impact that species or the protected habitat.

Conservation strategies are most effective at meeting goals of maintaining healthy populations of focal species and other wildlife when they are designed to meet habitat requirements of multiple species, implemented at multiple scales, and coordinated among various landowners and land management agencies. This type of ecosystem management requires integrating the diverse values and goals of landowners with different management options for wildlife conservation. The management actions implemented also must consider the most appropriate focal species and habitat conditions based on site-specific factors unique to each parcel of land. Through coordination and combinations of

[14] For more information visit Thurston County's webpage on *Prairie Conservation and the Habitat Conservation Plan* at http://www.co.thurston.wa.us/planning/hcp/hcp-home.htm.

management actions across a landscape, these individual parcel scale actions can be used to achieve larger conservation objectives (Altman, 2000).

Table 8. Summary of Fish and Wildlife Habitat Issues, Strategies and Actions in the Chehalis Watershed

Issues	Strategies/Objectives	Monitoring Plans or Recommendations	Implementation Status / Actions (highlights)
Fish and Wildlife Habitat			
Most prevalent salmon habitat limiting factors are: barriers, riparian degradation, water quantity and quality, sedimentation, channel complexity and stability, loss of floodplain habitat/connectivity. Limited data for other non-fish species. Low summer flows, sediment, floodplain connectivity, and non-native predators limiting to many non-fish species. Habitat loss and invasive non-native species are primary issues for upland and prairie species.	Attain a healthy and diverse population of wild salmonids. Restore, enhance, and protect the Grays Harbor Estuary. Restore and preserve properly functioning riparian areas. Restore habitat access. Restore properly functioning hydrology. Restore floodplain and stream channel function. Prioritize habitat projects and activities. Develop HCP.	Chehalis habitat work group analyzed conditions and prioritized each limiting factor-assigned Tier 1, 2, or 3. ASEP recommendations: remove/improve barriers to fish passage, riparian enhancement, silt reduction, habitat complexity, removal of non-native predators, and site-specific project design.	Salmon Habitat Restoration and Preservation Strategy suggest actions for primary (Tier 1, 2, 3) concerns with water quality, quantity, riparian areas, LWD, fish passage, floodplain, and sediment (starting on pg. 69). Thurston County in the process of developing the HCP for important species and habitat, including prairie.

2.1.6.4 Flood Hazards

Catastrophic flooding has been a reoccurring concern in the Chehalis Basin. The five largest flood events recorded in the Chehalis River near Grand Mound have all occurred since 1986. The 1990, 1996, 2007, and 2009 floods are the largest on record and caused massive damage to private property, public buildings, roads, and bridges (Governor's Chehalis Basin Work Group, 2014). Furthermore, the estimate for a statistical 100-year flood has increased 33% in the last 30 years, which suggests that floods are getting more frequent, more severe, and are causing more damage than ever before.

The 2013 report from the University of Washington (UW) Climate Impacts Group (CIG) submits that rain dominant basins like the Chehalis will see increases in peak flows on average of 18% in the "low" climate change scenario and 90% in the "high" scenario (Climate Impacts Group, 2013).

The Chehalis River Basin Flood Authority was created to take action to protect public safety and assets, prevent flood damage, and reduce flood hazards. In 2010 a report by Earth Economics on *Flood Protection and Ecosystem Services in the Chehalis River Basin* was developed to inform the Flood Authority's decision-making process and increase the efficacy of future flood protection investments.

Flood protection is defined in this study as flood damage prevention and hazard reduction. The economic value of natural systems is estimated in this study, which allows traditional flood project cost/benefit analysis to include ecosystem services. Flood protection is only one of many benefits (ecosystem services) provided by natural systems in the Chehalis Watershed.

This report for the Chehalis River Basin Flood Authority suggested an integrated flood management approach tailored to the basin that considers multiple goals, such as farmland protection and habitat restoration, and that uses a variety of engineered solutions (dams and levees), natural infrastructure and ecosystem services (water storage in wetlands and on agricultural lands), and social infrastructure (land use planning).

Table 9. Summary of Flood Hazard Issues, Strategies and Actions in the Chehalis Watershed

Issues	Strategies/Objectives	Monitoring Plans or Recommendations	Implementation Status / Actions (highlights)
Flood Hazards			
Five largest flood events since 1986. Projected increases in peak flows and 100-year flood events (18%) from climate change (CIG)	Integrated flood management approach that considers multiple goals such as farmland preservation and habitat restoration	Earth Economics study suggested to use a variety of engineered solutions, natural infrastructure, and ecosystem services (water storage in wetlands and ag lands), and social infrastructure (land use planning)	Chehalis Basin Flood Authority working on flood protection plans and actions. Considering flood retention or multipurpose dam to reduce floods and store water during winter and release during summer for fisheries and water quality enhancement, also identified small scale projects for reducing flood damage

2.1.6.5 Loss of Farmland

The Community Farmland Trust identifies 65 acres of farmland in the Lower Chehalis Watershed and 34,516 acres of farmland in the Upper Chehalis Watershed (Fisher & Mitchell, 2009). Of 47,034 acres along the Chehalis River (of which 3,264 acres are identified as agricultural lands) in Thurston County, 73% (2,384 acres) of now urbanized acres (4,468) were previously identified as agricultural lands (Fisher & Mitchell, 2009). Likewise, of 78,971 total acres surrounding the Black River (2,110 identified as agricultural lands) in Thurston County, 27% of urbanized acres were previously agricultural lands (Fisher & Mitchell, 2009). See Table 10.

Table 10. Urbanization in the Chehalis Watershed, 1985-2000[15]

Local Watershed	*Total Acres*	*Agriculture Lands*	*Total Acres Urbanized*	*% of Urbanized Acres that were Agricultural Lands*	*Estimated Number of Acres that were Agricultural Lands*
Skookumchuck	55,163	236	291	81.10 %	191
Chehalis	47,034	3,264	4,468	73.05 %	2,384
Black	78,971	2,110	7,909	26.68 %	563

Between now and 2025 is expected to be the beginning of major population growth for the Chehalis Watershed. Current land use forecasts estimates an approximate 80,000 person increase by 2025, making a total population of 140,000 – over a 50% increase from the current population to the projected population (Chehalis Basin Partnership, 2004). Examining land use in low-lying areas close to water resources, about 87% of the basin is forestry and only 11% identified as agriculture, urban or industrial uses. However, when identifying areas within one mile of the developed segments of major Chehalis Basin rivers, these three uses (agriculture, urban or industrial) climb to 42% (Chehalis Basin Partnership, 2004). Areas with the most farming are primarily low-lying valleys near the Chehalis River or tributaries, including the Skookumchuck and Black Rivers and Scatter Creek (Chehalis Basin Partnership, 2004).

There are four identified Urban Growth Areas within the Chehalis Watershed: Grand Mound, Bucoda, Tenino, and the southwestern portion of Tumwater. Farmland that is closer in proximity to Urban Growth Areas are considered at a higher risk of conversion. In the Chehalis Watershed, there are approximately 1,486 acres of agricultural activities within the four UGA's identified in the watershed. Nearly 68% of identified agricultural activities in the 2011 VSP Baseline (42,534 agricultural activity acres out of 62,241 total agricultural activity acres) lie within three miles of the four UGA's.

Table 11. 2011 Baseline Agricultural Activities & their Proximity to UGA's in the Chehalis Watershed[16]

Distance from a UGA	*Acreage*	*Percent of total Ag Activities*
Within	1,486	2 %
< 1 mile	15,377	25 %
< 2 miles	14,116	23 %
< 3 miles	11,555	19 %
Total	42,534	68 %

[15] This table has been adapted from Mitchell & Fisher's Community Farmland Trust, 2009 http://www.communityfarmlandtrust.org/uploads/1/3/6/4/13649505/thurston-county-farmland-inventory1.pdf original data from "The Rate of Urbanization and Forest Harvest in Thurston County, 1985-2000, TRPC, 2002.

[16] Calculated using 2012 VSP Ag Activities Baseline Layer and 2016 UGA data from Thurston County GeoData

The Capitol Land Trust has worked to conserve more than 2,880 acres and 28 miles of river shoreline across 18 sites in the Chehalis watershed, including working ranches and farms. Approximately 2,000 of those acres are located in the Black River Watershed (Capitol Land Trust, 2016). Some of the properties that are being conserved include the Gordon Farm Conservation Easement and the Holm-Rader Farm Conservation Easement. Other sites under conservation include the Helsing Junction Farm, which is 42 acres in Rochester, WA owned by the PCC Farmland Trust since 2015 (PCC Farmland Trust, 2016) and the Scatter Creek Farm and Conservancy, established in 2013, that is 48 acres along the Chehalis River owned by SSCFLT (South Sound Community Farmland Trust, 2016). Other efforts and existing strategies to protect farmland in this watershed include Long Term Agriculture zoning and the Open Space Tax Program. In the Chehalis Watershed in 2011, 8,490 acres were protected in Long Term Agriculture. There are 16,614 acres protected in the Assessor's Open Space Program for Farm and Agricultural Current Use, and 4,041 acres protected in the Commissioner's Open Space Program for Farm and Agricultural Conservation Land.

2.2 Deschutes Watershed Overview

2.2.1 Geography and Hydrology

The Deschutes River basin (WRIA 13) encompasses 270 square miles, with the majority of the watershed falling within Thurston County (235 square miles) and a small portion in Lewis County. Thirty seven percent of Thurston County is located within this watershed. The Deschutes River enters Thurston County from the south across the Lewis County border through forested hills that rise up to approximately 2,200 feet in elevation. The river winds down from the hills in a northwest direction, to its drainage point in Budd Inlet via Capitol Lake, a man-made impoundment of the river mouth.

The hills in the southern portion of the watershed are composed primarily of erosion-resistant andesite flows that yield little groundwater. The remainder of the watershed is primarily covered with glacially-derived Vashon age deposits of glacial outwash gravel and sand that are highly permeable, interspersed with islands of low permeability Vashon glacial till and glacial drift. The outwash gravels and sands are both capable of yielding significant groundwater volumes (Roberts et al., 2012; Thurston County, 2013).

The southern part of the watershed in the foothills contains large areas mapped as "rain-dominated zones" as well as areas of "rain-on-snow zones." Much of the precipitation that falls in this area runs off because of the impermeable andesite flow that dominates the landform (Thurston County, 2013). The Deschutes River is the primary stream draining the Deschutes watershed. There are also many small tributaries to the Deschutes River, including (from upstream to downstream): Little Deschutes River, Johnson Creek, Mitchell Creek, Fall Creek, Hull Creek, Pipeline Creek, Lake Lawrence Creek, Reichel Creek, Silver Creek, Offut Lake Creek, Tempo Lake Outlet Creek, Spurgeon Creek, Ayer (Elwanger) Creek, and Chambers Creek.

The Deschutes watershed contains many important areas for surface water storage such as depressional wetlands, lakes, 100-year floodplain, and unconfined river channels. Lakes within the basin include: Barnes Lake, Hewitt Lake, Munn Lake, Lake Susan, Trails End Lake, Sheehan Lake, Sunwood Lake, Smith

Lake, Southwick Lake, Tempo Lake, Offut Lake, McIntosh Lake, Reichel Lake, and Lake Lawrence. Tempo Lake is a human-made reservoir created in 1962 from an area that was originally an alder farm. Tempo Lake does not have an inlet stream. It drains via an unnamed stream to the Deschutes River. The lake level is controlled by the residents of the Tempo Lake subdivision through a dam/control structure located at the Tempo Lake outlet (Thurston County, 2013). There are also numerous small, Palustrine wetlands and depressional wetlands scattered throughout the watershed, with concentrations within the cities of Tumwater, Olympia, and Lacey, around Chambers and Spurgeon Creeks, and around Lake Lawrence.

The 100-year floodplain is mapped around the entire Deschutes River, with the floodplain areas expanding in the downstream reaches. Notable areas of wide 100-year floodplain exist (from upstream to downstream) near Lake Lawrence, Silver Creek, Offutt Lake, and between Offutt Lake and the City of Tumwater. Areas of potential channel migration zones exist along the length of the Deschutes River. General areas where the potential channel migration may go beyond the 100-year floodplain are located (from south to north): along the upper reaches of the Deschutes in the south county hills, between Mitchell Creek and Hull Creek, near the Silver Creek/Deschutes River confluence, around Offutt and Tempo Lakes, and along the Tumwater UGA boundary (Thurston County, 2013).

Areas with high permeability soils are important for aquifer and river recharge. High permeability deposits are found around the Deschutes River channel. The high permeability area is fairly narrow in the south, widening as the river moves north through the cities to be almost the entire width of the watershed, and then going up in a wide swath around Woodard Creek and Woodland Creeks. The McLane Creek valley also has high permeability soils and is an important area for aquifer recharge.

2.2.2 Land Uses and Land Cover Estimates

The upper watershed is dominated by evergreen forest (28.9%), mixed forest (11.8%), scrub/shrub (10.3%), and low intensity development (10.9%). Compared to the other watersheds in Thurston, the Deschutes basin has the highest level of low intensity development, medium intensity development (4.8%), and developed open space (6.1%). The central watershed is covered by a mix of forest cover, scrub/shrub, pasture, and grasslands. The lower watershed is covered with low- and medium-intensity development, developed open space, forest, pasture/hay, and grassland.

The predominant land uses within the watershed are timber/forest land (27%), residential (24%), and undeveloped (18%), which includes agriculture. Timber/forest land is concentrated around the southern headwaters of the Deschutes, along the southern county border, north along the southwest side of the river until just south of Offut Lake, and in the northwest corner of the watershed west of McLane Creek.

The southern (upper) part of the watershed includes lands that are actively managed for commercial timber production as well as rural residential and agricultural uses. Weyerhaeuser Company, the Washington State Department of Natural Resources (DNR), and the U.S. Forest Service (USFS) own and manage public and private timberlands primarily in the southern headwaters.

The central watershed's primary land uses are agriculture, rural residential, timber/forest land, and undeveloped. It includes the city of Rainier. A large area of federally owned land that is part of Joint Base Lewis-McChord is located in the central watershed, east of Offut Lake and south of Spurgeon Creek. One major highway, State Route 507, traverses the study area through the town of Rainier (Thurston County, 2013).

The lower watershed is urbanized and within incorporated city boundaries and the urban growth areas of Olympia, Tumwater, and Lacey (Wagner and Bilhimer, 2014; Thurston County, 2013). The northern watershed contains urban levels of residential land use and other urban land use within the cities and their urban growth areas.

The majority of the Thurston County population lives within the Deschutes watershed, which is under tremendous growth pressure and has the highest concentration of impervious surfaces. The growth pressure is primarily located along the marine shorelines, and less developed basins (Thurston County, 2013). The majority of marine shoreline in the watershed has already been developed for residential use. There are also concentrations of impervious surface on the Cooper Point Peninsula, near Boston Harbor, Nisqually Reach, between Chambers and Spurgeon Creaks, in the town of Rainier, and around Offut and Lawrence Lakes. The flood plain and wetlands associated with the Deschutes River have been modified. Many of the areas adjacent to the rivers are utilized for agriculture. As a result of the agricultural practices within these areas, natural shoreline vegetation, associated habitat, and occasionally water courses have been altered.

2.2.3 Critical Areas

Critical Aquifer Recharge Areas

The most vulnerable critical aquifer recharge areas are primarily along major rivers and tributaries within the Deschutes watershed. The Deschutes watershed is characterized mostly by category 1 (extreme sensitivity) critical aquifer recharge areas, narrow in the south but widening to almost the whole width of the watershed as it moves north. Locations with category 1, extreme aquifer sensitivity include: areas surrounding the Deschutes River; along Rainier road bordering the Nisqually watershed; the northeast watershed in Hawk's Prairie; along Spurgeon Creek; along Chambers Creek; around Woodard and Woodland Creeks; and to the west of the Deschutes River to Percival Creek and the Upper Chehalis Watershed (as per TCC Ch 24). The Cooper Point Peninsula and South Bay are largely category 2 (high sensitivity) critical aquifer recharge area. A mosaic of category 1, 2, and 3 (moderate sensitivity) aquifers make up the remaining areas. See Critical Aquifer Recharge Area maps in Appendix E.

Areas at a greater risk of groundwater contamination and areas with high permeability soils that are important for recharge are identified as Critical Aquifer Recharge Areas. Much of the Deschutes River valley is composed of high permeability glacial outwash, with islands of low permeability glacial till and glacial drift. The majority of the three peninsulas between inlets are covered with low permeability soils. Recharge may be impaired in areas where impervious surfaces and non-forested vegetation covers high-permeability soils, including along the Interstate 5 corridor, in Lacey, Tumwater and Olympia and their

Urban Growth Areas, between Trosper Lake on the west, and Pattison Lake on the east. Concentrations of high permeability soils with non-forested vegetation are found in the central portion of WRIA 13, around the City of Rainier and south along the Deschutes to the Lake Lawrence area, as well as in the southern portion of the urban growth areas, between Chambers and Spurgeon Creeks, and the southern half of the Dana Passage peninsula. These areas are mostly associated with low density residential development and agricultural uses (Thurston County, 2013).

Wetlands

The flood plain and wetlands associated with the Deschutes River have mostly been modified. Many of the areas adjacent to rivers in the Deschutes watershed (WRIA 13) are utilized for agriculture (Thurston County 2013). Much of the marine shorelines in WRIA 13 have emergent wetlands. There are many small Palustrine wetlands and depressional wetlands scattered throughout WRIA 13 with concentrations on the three peninsulas, within the cities, around Chambers and Spurgeon Creeks, and around Lawrence Lake (Thurston County, 2013).

Surface storage has been impaired by the loss of depressional wetlands and the presence of the built environment adjacent to streams. There are a few areas within the cities and on peninsulas where depressional wetlands have been lost – mostly in the northern and more developed portion of WRIA 13, along the Deschutes River, and Percival, Green Cove, Indian Ellis, Woodard, and Woodland Creeks (Thurston County, 2013). The construction of Chambers Ditch reduced the extent and affected the quality of wetlands in this area (Levitt *et al.*, 2015).

Geologic Hazard Areas

Process intensive areas for sediment delivery are areas of surface erosion, mass wasting, and in-channel erosion. Sediment delivery via surface erosion occurs in areas with steep slopes and erodible soils, including areas concentrated in the south county hills, particularly on the southwest side of the Deschutes river and also in the hills to the west of McLane Creek in Capitol State Forest (Thurston County, 2013).

Sediment delivery via mass wasting occurs in high mass wasting hazard areas and landslide areas. There are substantial areas of potential mass wasting located in the forested hills south of the Deschutes River and McIntosh Lake in the southern section of WRIA 13. Sediment delivery via in-channel erosion occurs in unconfined channels or those with gradients less than 4%, which includes almost all of the streams in WRIA 13. Sediment delivery via surface erosion may be impaired in areas of non-forested land cover on highly erodible slopes adjacent to streams, as well as locations with roads within 200’ of aquatic ecosystems or road crossings. Only a few small areas of highly erodible slopes on non-forested land cover occur near aquatic ecosystems in WRIA 13. These are primarily due to active timber harvest and are located south of the Deschutes River, east from Reichel Lake (Thurston County, 2013). Sediment delivery via mass wasting may also be impaired by roads or non-forested vegetation in high mass

wasting hazard areas. These areas are primarily located in the south county hills, on the southwest side of the Deschutes River (Thurston County, 2013).

Frequently Flooded Areas

All of the Deschutes watershed marine shorelines are mapped within the 100-year flood plain. Most of the Deschutes River, McLane Creek, Woodard Creek, Woodland Creek, Chambers Creek, Spurgeon Creek, Silver Creek, Reichel Lake Creek, and the lakes are surrounded by 100-year floodplain. The Deschutes River is mapped within the 100-year floodplain, with floodplain areas expanding in the downstream reaches. Notable areas of floodplain exist near Lake Lawrence, Silver Creek, Offutt Lake, and between Offutt Lake and the City of Tumwater. Areas of potential channel migration zones exist along the length of the Deschutes River. General areas where the channel migration may go beyond the 100-year floodplain are located along the upper reaches of the Deschutes in the south county hills, between Mitchell Creek and Hull Creek, near the Silver Creek/Deschutes River confluence, around Offutt and Tempo Lakes, and along the Tumwater UGA boundary (Thurston County, 2013).

Fish and Wildlife Habitat Conservation Areas

The Deschutes River is mapped as supporting resident and sea-run Cutthroat trout, Coho, and fall Chinook salmon, sea-run and winter steelhead. The river is also mapped as supporting the spawning and rearing of fall Chinook, winter steelhead, and Coho salmon. The Deschutes did not historically have native salmon runs because the Tumwater Falls acted as a natural barrier to upstream migration. However, a fish ladder was constructed in 1954. Artificial runs of Coho and Chinook salmon have been established since the 1950's by the WDFW hatchery program.

The Deschutes basin contains the following priority habitats: Mazama pocket gopher, streaked horned lark, elk, Taylor's checkerspot, wood duck, osprey, wild turkey, and Oregon vesper sparrow. The following priority species are also mapped within this basin: waterfowl concentrations, western blackbirds, western bluebirds, and Oregon lamprey.

2.2.4 Agricultural Activities

The Deschutes watershed contains approximately 30,900 acres of agricultural activities, approximately 15% of the watershed. There are 2,962 acres zoned as Long Term Agriculture located southeast of Rainier View Park and the Deschutes River, south of the railroad and north of SR 507 SE, and in patches of the central western portion of the Watershed. This acreage, as of 2016, has remained the same as the 2011 baseline. The southeastern portion of the Deschutes Watershed is largely Rural Residential Resource 1/5 that frequently contains agricultural activities.

In the Spurgeon Creek basin, the shoreline along the upper creek has been cleared for agriculture with little observable riparian vegetation (Levitt *et al.*, 2015). Likewise along the Deschutes River, riparian

vegetation along the shoreline has been cleared for agricultural purposes and other land uses. The Silver Creek arm of the shoreline jurisdiction and the east bank of the Deschutes contains large areas cleared for agriculture. This area has concentrations of commercial and non-commercial operations, including dairy and other livestock, poultry, food and other crops, hay, and Christmas tree plantations (Levitt *et al.,* 2015).

2.2.5 Intersection: Agriculture and Critical Areas

Agricultural activities are generally located in the low-lying valleys adjacent to the Deschutes River and its major tributaries and within or near frequently flooded areas. There are concentrated areas of agricultural activities in South Bay along Budd and Henderson Inlet, south of Lacey and Tumwater and west of Fort Lewis, south of Fort Lewis and west of Rainier, on southeast along the Deschutes-Nisqually watershed border. The majority (87%) of agricultural activities in the Deschutes Watershed intersect with Critical Aquifer Recharge Areas. Approximately 58% intersect with Wildlife Habitat Conservation Areas. Approximately 21% of agricultural activities intersect with frequently flooded areas; about two-thirds of this is tidal shellfish area within the Puget Sound. Only 7% of agricultural activities intersect with Geologic Hazard Areas, and 11% with Wetlands. Agriculture intersecting with critical areas specific to the Deschutes watershed in Thurston County is analyzed below in Table 12.

Table 12. Intersection of Agricultural Activities and Critical Areas with the Deschutes Watershed

Critical Area	Agricultural Activities Total Acreage	Percentage of Intersection
Total	*30,900*	--
Wildlife Habitat Conservation Areas	18,053	58 %
Geologic Hazard Areas	2,088	7 %
Critical Aquifer Recharge Areas	26,943	87 %
Frequently Flooded Areas (FEMA Flood Zones)	6,426	21 %
Wetlands	3,476	11 %

The Deschutes Watershed estimates a higher number of agricultural activities intersect with important fish and wildlife habitat, compared to an estimated 50% (Fisher & Mitchell, 2009). There are 14,682 acres (54%) of agricultural activities within the Nisqually watershed that intersect with gopher soils. Approximately 14% of those are high preference soils, 28% are medium preference soils, and 58% are

low preference soils[17]. This indicates that pocket gophers are present within or adjacent to many of the areas where agricultural activities are currently being conducted in the Deschutes Watershed.

2.2.6 Existing Issues and Strategies

2.2.6.1 Water Quality

The Deschutes River and tributaries have a number of water quality violations that place it on the federal Clean Water Act Section 303(d) list for dissolved oxygen, fecal coliform, temperature, pH, and fine sediment. Thurston County's Environmental Health monitoring program ranks water quality as "Good" in the Deschutes River, Chambers and Spurgeon Creek, and "Fair" for Lake Lawrence; however a number of streams and water bodies in the Deschutes Watershed are listed on the federal Clean Water Act 303(d) list of polluted waters. Waters that are currently Category 5 on Ecology's Water Quality Assessment and therefore require a TMDL or Water Quality Improvement project include Adams Creek, Ayer (Elwanger) Creek, Barnes Lake, Blake Lake Ditch, Budd Inlet (inner and outer), Capitol Lake, Deschutes River, Ellis Creek, Henderson Inlet, Huckleberry Creek, Indian Creel, Johnson Creel, Lake Lawrence Creek, Lawrence Lake, Long Lake, McIntosh Lake, McLane Creek, Mission Creek, Mitchell Creek, Moxlie Creek, Nisqually Reach and Drayton Passage, Offutt Lake, Pattison Lake, Percival Creek, Reichel Creek, Schneider Creek, Sleepy Creek, Spurgeon Creek, Squaxin/Peale/Pickering Passages, Tempo Lake Outlet, Thurston Creek, and 4 unnamed creeks, Ward Lake and Woodland Creek.

The Washington State Department of Ecology completed a technical study on the Deschutes River, Capitol Lake, and Budd Inlet. The findings indicated that temperature, fecal coliform bacteria, dissolved oxygen, pH, and fine sediment levels violated Washington's surface water quality standards (Wagner & Bilhimer, 2015).

In 2015, Ecology released a draft Water Quality Improvement Report / Implementation Plan for the Deschutes TMDL area that contains numeric load allocations for temperature, bacteria, dissolved oxygen, pH, and fine sediment (Levitt *et al.*, 2015). Implementation actions identified in the freshwater TMDL include to establish forested riparian buffers and conserve existing buffers on the Deschutes River and other streams, reduce fecal coliform bacteria during the summer months, stabilize channels that contribute sediment, reduce nutrient sources, and quantify water withdrawals. The TMDL recommendations focus on restoration of degraded functions and do not consider in detail future growth within the watershed. Specific recommendations include (Wagner & Bilhimer, 2015):

1. Institute Low Impact Development (LID) for future development in appropriate areas in the watershed.
2. Preserve existing riparian vegetation, and restore areas with young or no vegetation.

[17] Calculated using the acreage of a preference of soils divided by the total acreage of gopher soils. This uses preferred gopher soils as of 2014. Soils may be reclassified into a different preference, added or eliminated, which can cause these percentages and acreages to fluctuate to non-environmental factors.

3. Enhance channel complexity, including large woody debris within the active riverbed.
4. Maintain and enforce the current status of the Deschutes River watershed closed water withdrawal, eliminate illegal withdrawal, and quantify and mitigate the effect of exempt wells.
5. Agricultural operations, including livestock operations, should eliminate offsite transport of sediments, bacteria, and nutrients through implementation of BMPs to properly manage stormwater, heavy use areas, and manure generated on site.

2.2.6.2 Water Quantity

The Deschutes Watershed is a very intensely farmed basin in western Washington, affecting water availability in the Deschutes River and tributary creeks and streams. Annual precipitation in the watershed ranges from 40 inches to 80 inches per year. The majority of the precipitation arrives in the winter months when water demands are lowest. During summer, the snowpack is gone and there is little rain, so naturally low stream flows depend on groundwater inflow. Coupled with a significant population increase over the past 20 years in the watershed, this has put increased pressure on water availability.

The Deschutes Watershed Plan identifies existing issues to water availability within the watershed. Water uses range across the watershed, but city utilities are the largest water providers. Residential use (in-house use and residential landscape irrigation) accounts for about 60% of water use in the watershed. Approximately 70% of residential water use is supplied by city water systems. The remaining 30% of use is divided roughly equally between three categories of suppliers: 1) large private water systems serving >100 people, 2) ~100 small privately owned water connections serving < 100 people, and 3) 3,500 single-family wells (Deschutes Watershed Planning Unit, 2004). Irrigation use for crops, grass, and landscape makes up approximately 30% of total annual water use in WRIA 13. New water system plans in Lacey and Olympia have a conservation target of a 1% annual reduction in per-capita use through the 20-year planning period to 2022. Tumwater includes conservation in the water system plan but has not identified a conservation target. Because city utilities compose the majority of water usage in the watershed, conservation savings can be significant over time.

2.2.6.2.1 Future Concerns for Water Quantity – Growth

Thurston County, in partnership with Thurston Regional Planning Council (TRPC), received a grant through the National Estuaries Program to develop and implement changes to land use in the Deschutes Watershed to protect and improve water quality and quantity. The goal of this project is to reduce impacts to water quality and quantity from current and future residential development in the Deschutes Watershed by developing land use policy that directs growth away from areas with properly functioning ecological processes and lessens the impact on areas that do develop. (Levitt *et al.*, 2015). Future residential development in the Deschutes watershed is expected to have an effect on the function of ecological processes.

There is limited water availability for new uses in the watershed; much of the water in the Watershed has already been spoken for. Washington Administrative Code (WAC) 173-513 is the instream flow rule for the Deschutes River watershed, including Spurgeon Creek and Woodland Creek and drainages

(Ecology, 2012). This rule closes and partially closes numerous streams to new uses, and adopts instream flows on other streams and creeks. There is no water set aside for future use in the Deschutes Watershed. Future applicants of water rights in the watershed will likely need to mitigate for their impacts on surface water and groundwater.

2.2.6.2.2 Recommendations for Water Quantity Issues – Deschutes Watershed Plan

The Deschutes Watershed Plan was developed over the course of several years, from 1999 to 2004, but fell one-vote short of a unanimous vote needed in order for the plan to proceed to adoption. This plan recommends several actions to improve water quality management, including to support conservation as a preferred source of additional supply, improve effectiveness of water rights management, and develop a mitigation framework to protect instream flow (Deschutes Watershed Planning Unit, 2004). The following guiding principles are given for water quantity management in WRIA 13:

1. Protect instream resources while providing essential water to the communities.
2. All water used should strive for the most efficient use.
3. Source development should emphasize conservation and "recycling" of water rights.
4. When new water rights are necessary, instream flow should be protected and impact avoided where feasible; then the impact should be minimized; finally, unavoidable impacts should be mitigated.
5. Water rights should be managed to the extent feasible.
6. The WRIA 13 Water Quantity element must in no way be construed as defining or quantifying Tribal treaty or legal rights to water.

One of the main concerns in the watershed management plan is that transfers of water could potentially threaten vital water supply for designated agricultural and growth areas. Designated agricultural lands are of "long-term commercial significance", as identified in the Thurston County Comprehensive Plan. These lands are zoned Long-Term Agriculture, and depend on an affordable land base, fertile soils, and ground and surface water quality and quantity. Without a clear policy framework, there is little guidance regarding public interest in retaining water rights for agricultural lands designated as Long-Term Agriculture (Deschutes Watershed Planning Unit, 2004).

One primary recommended conservation action is to design and implement a water supply management framework for independent irrigation and industrial water uses within WRIA 13, with a sub-action to improve agricultural water use efficiency, especially within Long-Term Agriculture areas (Deschutes Watershed Planning Unit, 2004). This is achieved through the Department of Ecology, Thurston Conservation District, and other agencies working with agricultural operators to improve water use efficiency. A water trust or water bank may be useful to help implement agricultural water use improvements, especially when there is conflict between agricultural water use and instream flow.

2.2.6.3 Fish and Wildlife Habitat

Major habitat limiting factors are described in the WRIA 13 Salmon Habitat Limiting Factors report (Haring & Konovsky, 1999). The categories of habitat limiting factors include: loss of access to spawning and rearing habitat, floodplain conditions, streambed substrate conditions, streambank stability, presence of Large Woody Debris, riparian conditions, water quality, water quantity, estuarine and nearshore habitat, lake-habitat, and biological processes. These categories overlap with each other and one habitat problem could impact more than one habitat limiting factor.

The primary focus for terrestrial and upland wildlife habitat issues is on prairie species of concern, many of which are either currently listed under the Endangered Species Act (ESA) or are current candidates for listing. Some of these species include the Taylor's checkerspot butterfly, the Streaked horned lark, the Mazama Pocket Gopher, and the Oregon spotted frog. These species have designated or proposed critical habitat, with the reason for their decline mostly contributable to habitat loss of prairie, grasslands and oak sites, and emergent wetlands and slow-moving shallow waterbodies.

Thurston County is currently working with U.S. Fish and Wildlife Service (USFWS) on strategies to protect a variety of prairie species through the development of a Habitat Conservation Plan (HCP). The goal of this plan is to protect threatened and endangered species from further decline while still allowing for development. A Habitat Conservation Plan ultimately means more certainty in the environmental review process and for individual landowners.

With the listing of the Mazama pocket gopher under the endangered species act in 2014, the 4(d) special rule was included to allow limited, accidental harm if those actions provide an overall greater benefit to the conservation of the species. The U.S. Fish and Wildlife Service included a 4(d) special rule for activities that promote the maintenance of open habitat or restoration of habitat conditions necessary to conserve the four subspecies. These include general activities on agricultural and ranching lands, regular maintenance on civilian airports, control of noxious weeds and invasive plants, and right-of-way roadside maintenance (USFWS, 2014).

2.2.6.3.1 Recommended Actions for Fish and Wildlife Habitat

Some recommendations for protecting and restoring salmonid habitat from the WRIA 13 Salmon Habitat Limiting Factors report include (Haring & Konovsky, 1999):

- Reestablish mature riparian buffers of sufficient width to slow the rate of lateral erosion of the channel; maintain functional riparian buffers throughout the migration zone.
- Continue to actively develop and implement strategies to prevent point and non-point source water quality impacts to salmonid habitat.
- Restore large woody debris presence in the channel.
- Identify points of unrestricted livestock access to the channel and report to Thurston County Health Department.

The Deschutes Watershed Management Plan has habitat recommendations that are primarily directed at protecting aquatic habitat. Critical fish habitat is the focus of recommendations, with a mission to:

"Create a long-range water resource management framework to protect aquatic habitat and provide water for vital community needs" (Deschutes Watershed Planning Unit, 2004). Key findings for WRIA 13 include: to protect stream and nearshore habitat for aquatic and riparian species; go beyond habitat restoration projects and regulation to achieve permanent protection; and gain local government participation in ordinance implementation and a systematic code enforcement. Habitat recommendations are intended to supplement the Salmon Habitat Protection and Restoration Plan for WRIA 13, and include (Deschutes Watershed Planning Unit, 2004, pp. V3-V6):

- Habitat Recommendation 1: Identify and implement priority actions in the "Salmon Habitat Protection and Restoration Plan for Water Resource Inventory Area 13" and other salmon habitat strategies for the South Sound region.
- Habitat Recommendation 2: Minimize habitat degradation from land use activities enforcing local Critical Area, Shoreline and other habitat-oriented regulations.
- Habitat Recommendation 3: Initiate a long-term broad-based program that will provide permanent protection of sensitive habitat areas in WRIA 13 watersheds.
- Habitat Recommendation 4: Support the Deschutes estuary restoration feasibility study.
- Habitat Recommendation 5: Manage stormwater to reduce impacts to stream habitat.
- Habitat Recommendation 6: Use watershed level assessments as input to land use management decisions that are necessary to protect critical areas.
- Habitat Recommendation 7: Fill important data gaps regarding stream and nearshore habitat.

The Salmon Habitat Protection and Restoration Plan for Water Resource Inventory Area 13 identifies and prioritizes projects that protect and restore habitat for salmonids that occur in the marine and freshwater environments of WRIA 13. Strategic goals include (Thurston Conservation District, 2005):

- Protect habitat through conservation easements and acquisition where the habitat is intact.
- Restore functions in areas where natural processes can be recovered, not just symptoms treated.
- Address gaps in our knowledge of fish populations, fish use, and condition of natural processes.
- Give priority to projects that directly benefit high priority salmonid stocks.
- Give priority to intact watershed.

Core summer salmonid habitat and salmonid spawning, rearing and migration are the primary focus for habitat protection in the Deschutes River. Fish and wildlife habitat is specifically addressed in the Deschutes Total Maximum Daily Load report as being impaired and that can have improved protection by reducing loads of bacteria, pH, dissolved oxygen, temperature, and fine sediment into a number of water bodies. Increased delivery of sediment poses a problem for substrate composition and channel morphology, leading to lower quality spawning habitat. Dissolved Oxygen is also required for salmonid egg survival, which may be impeded if fine sediment disrupts oxygen exchange (Wagner & Bilhimer, 2015). In this TMDL, the following numeric criteria apply to designated aquatic life uses (Wagner & Bilhimer, 2015, pp. 16-19):

- Dissolved Oxygen

1. To protect the designated aquatic life for Core Summer Salmonid Habitat, the lowest 1-day minimum oxygen level must not fall below 9.5 mg/L more than once every 10 years on average.
2. To protect the designated aquatic life for Salmon and Trout Spawning, Rearing and Migration, the lowest 1-day minimum oxygen level must not fall below 8.0 mg/L more than once every 10 years on average.

- pH
    1. To protect the designated aquatic life uses of Core Summer Salmonid Habitat, pH must be kept within a range of 6.5 to 8.5, with a human-caused variation within the above range of less than 0.2 units.
    2. To protect the designated aquatic life uses of Salmonid Spawning, Rearing, and Migration, pH must be kept within the range of 6.5 to 8.5, with a human-caused variation within the above range of less than 0.5 units.
- Fine Sediment (governed by narrative standards, no numeric targets established)
    1. Less than 12% fine sediments in gravels is considered good habitat quality.
    2. From 12% to 17% fine sediments in gravels is considered fair habitat quality.
    3. Greater than 17% fine sediments in gravels is considered poor habitat quality.

2.2.6.4 Flood Hazards

The Deschutes River is the fastest rising (and falling) river in Thurston County, and responds quickly to local rainfall and runoff. Minor flooding (low-lying roads and pasturelands) occurs at a height of about 9.5 feet. Individual residences are threatened at about 11.5 feet, and at 13.5 feet there is a widespread threat to communities. The highest historical crest on record was January 9, 1990, peaking at 17.01 feet and was categorized as a major flood that inundated roads, farm lands, and residential areas of Cougar Mountain, Driftwood Valley, Falling Horseshoe and areas downstream in the Tumwater Valley. At this height, flooding occurred along the river's headwaters, tributaries and other streams in the basin. Other major floods occurred on February 8, 1996 at 15.74 feet; January 15, 1974 at 15.68 feet; and January 21, 1972 at 15.28 feet (Thurston County, n.d.). A moderate flood occurred January 8, 2009 at 14.47 feet, resulting in flooded residential areas and many roads and farmlands (Thurston County, n.d.).

There is ongoing work to develop flood risk maps of the marine coastal areas and within the Deschutes Watershed. Thurston County Emergency Management has worked with FEMA under the RISK MAP program to update all the building stock and critical facility data in the HAZUS-MH program- an application that displays hazard data and estimates potential losses from natural disaster.

Mitigation has been one form to prevent flood damage within the watershed. In October of 2013, a landowner came to the County to report the Deschutes River was moving closer to the structure. After inspection, the structure was reported unsafe and removed. This parcel is now unbuildable in the County permit system (Thurston County, 2014). In the 2013-2014 period, three properties that were identified for elevation, relocation or buyout were tagged in the Deschutes River Flood Plain and submitted for a funding request through the FEMA Hazard Mitigation Program.

2.2.6.4.1 Recommended Actions for Frequently Flooded Areas

Floodplain connectivity is identified as one limiting factor to WRIA 13 salmonid rearing and spawning habitat. Recommendations to address floodplain connectivity include: improve land use regulations and enforcement; prevent development on floodplains and along channel banks; remove or setback dikes, and remove riprap; and restore meandering channel geometry (Thurston Conservation District, 2005).

The Deschutes Watershed Planning Committee proposed that storage facilities may be beneficial to reducing flood damage but also augmenting low summer flows for instream resources. Other efforts to reduce flooding include environmental outreach and education, stormwater runoff management, stormwater facilities inspections, on-site consultation on drainage issues, free workshops for residents on how to maintain stormwater ponds, and constructing and maintaining stormwater facilities (Levitt *et al.,* 2015).

2.2.6.5 Loss of Farmland

The Community Farmland Trust identifies 15,781 acres of farmland in the Deschutes Watershed (Fisher & Mitchell, 2009). Of 104,019 acres along the Deschutes River (1,427 identified as agricultural lands) in Thurston County, 20% of urbanized acres (7,148) were previously identified as agricultural lands (Fisher & Mitchell, 2009).

Table 13. Urbanization in the Deschutes Watershed, 1985-2000[18]

Local Watershed	*Total Acres*	*Agriculture Lands*	*Total Acres Urbanized*	*% of Urbanized Acres that were Agricultural Lands*	*Estimated Number of Acres that were Agricultural Lands*
Budd/Deschutes	104,019	1,427	7,148	19.96 %	285
Eld Inlet	23,534	73	1,465	4.98 %	4
Henderson Inlet	31,832	1,470	4,462	32.94 %	484

There are 4 identified Urban Growth Areas within the Deschutes Watershed: Rainier, Tumwater, Olympia, and Lacey. Farmland that is closer in proximity to Urban Growth Areas are at a higher risk of conversion. One example is the Ron Smith Farm, located along the Deschutes River Mainstem near the Lake Lawrence outlet channel. The cities of Olympia, Yelm and Lacey purchased water rights from the 197-acre farm, which will result in the retiring of the farm's irrigation water rights to help offset the effects of the cities on the Deschutes River (Ecology, 2016). In the Deschutes Watershed, there are approximately 2,800 acres of agricultural activities within the 4 UGA's identified in the watershed.

[18] This table has been adapted from Mitchell & Fisher's Community Farmland Trust, 2009 http://www.communityfarmlandtrust.org/uploads/1/3/6/4/13649505/thurston-county-farmland-inventory1.pdf original data from "The Rate of Urbanization and Forest Harvest in Thurston County, 1985-2000, TRPC, 2002.

Nearly 75% of identified agricultural activities in the 2011 VSP Baseline (20,769 agricultural activity acres out of 27,817 total agricultural activity acres) lie within 3 miles of the four UGA's.

Table 14. 2011 Baseline Agricultural Activities & their Proximity to UGA's within the Deschutes Watershed[19]

Distance from a UGA	*Acreage*	*Percent of total Ag Activities*
Within	2,800	10 %
< 1 mile	8,538	31 %
< 2 miles	6,981	25 %
< 3 miles	2,450	9 %
Total	20,769	75 %

Several areas are under easement with land trusts in this watershed. The Northwest Rangeland Trust has the 300-acre Mahan Dairy Farm in Rainier under conservation easement since 2015 (Northwest Rangeland Trust, 2016). The Mahan Dairy Farm is one of the largest intact working prairie landscapes, and is currently used as a cattle ranch. The Capitol Land Trust protects several properties in this watershed, including the Lonseth Preserve (60 acres) and the Harmony Farm Conservation Easement (55 acres) (Capitol Land Trust, 2016). Within the Deschutes watershed, Capitol Land Trust has preserved 220 acres across 8 sites, including 12,000 feet of shoreline along the Deschutes River. Other efforts and existing strategies to protect farmland in this watershed include Long Term Agriculture zoning and the Open Space Tax Program. In the Deschutes Watershed in 2011, 2,962 acres were protected in Long Term Agriculture. In 2011 there were 9,254 acres protected in the Assessor's Open Space Program for Farm and Agricultural Current Use, and 622 acres protected in the Commissioner's Open Space Program for Farm and Agricultural Conservation Land.

2.3 Nisqually Watershed Overview

2.3.1 Geography and Hydrology

Thurston County incorporates approximately 17%, or 131 square miles of the 761 square miles of the Nisqually Watershed (WRIA 11). The remaining acreage of the Nisqually Watershed is located in Lewis County (approximately 25%) and Pierce County (approximately 58%) (Thurston County, 2013a). Originating from the Nisqually Glacier on the southern slope of Mt. Rainier in Mt. Rainier National Park, the Nisqually River travels approximately 78 miles west-northwest and provides the border between Thurston and Pierce Counties until it discharges into Puget Sound (Thurston County, Sept. 2013b). The northern border of the Nisqually watershed occurs at the confluence of the river into Puget Sound. The

[19] Calculated using 2012 VSP Ag Activities Baseline Layer and 2016 UGA data from Thurston County GeoData

Nisqually River and its tributaries includes 332 individual streams in WRIA 11. Also included are two independent streams: McAllister Creek and Red Salmon Creek.

The flow of the Nisqually River and its tributaries is determined primarily by rainfall, snow, and glacial melt at the headwaters, as well as the actions of dams located in the upper reaches of the river – Alder Dam and LaGrande Dam. LaGrande Dam is located at river mile 42, and is the upper extent of anadromous fish usage today. The lower Nisqually Basin, approximately 382 miles of the total 714 miles of stream, lie below this dam and have the potential for anadromous fish use, however much of that length is compromised due to insufficient flow or natural migration barriers (Thurston County, 2013b). The Alder Dam stores and filters fine sediment (glacial flour) during summer and early fall, which causes the river to turn a milky green. As a result, water clarity in the lower river is much higher in the summer months than it was historically.

The southernmost portion of the Nisqually Basin, including Mt. Rainier and the land surrounding Alder Lake, are primarily made up of volcanic deposit and alpine glacial drift. The mid-section of the watershed, including Yelm, is made up of glacial till, glacial moraines and glacial outwash. The lowlands, including the Nisqually Indian Reservation and Nisqually National Wildlife Refuge, are made up mostly of glacial drift and alluvium (Thurston County, 2013a).

The upper portion of the Nisqually Basin (including the Mashel, Ohop, and Powell sub-basins) depends on water mostly from snowmelt, whereas the lower Nisqually Basin and tributaries relies on rainfall. The annual precipitation pattern is characterized by low summer precipitation and high winter precipitation and snowpack at higher elevations. Areas important for water delivery are areas with relatively higher precipitation and “rain-on-snow” areas. The Nisqually Basin has the lowest areas of mean annual precipitation in the County, about 38 inches, near Clear Lake and Bald Lake. The west side of Alder Lake contains some areas mapped as “rain-on-snow zones”, whereas Alder Lake north to Bald Lake is mapped as a “rain-dominated zone” (Thurston County, 2013a).

River flow is generally highest from November through February, when rainfall and snowfall events are greatest. Stored snowfall and glacial melting at higher elevations helps to maintain water flow into the summer, when it is needed most for agriculture. Flash flooding occurs sporadically (every 3 to 10 years) in the upper basin as the result of Jokulhlaups- a flash flood caused suddenly by glacial melt collecting behind and then collapsing an ice dam (Thurston County, 2013b).

There are several deep aquifers within the Nisqually watershed that are connected to surface waters and discharge into the Puget Sound. Most of the Nisqually Basin occurs on low permeability soils, where the majority of wetlands and depressional wetlands are located. Important areas for surface water storage are areas containing depressional wetlands, wetlands, lakes, 100-year floodplain and unconfined river channels. Large areas of depressional wetlands are located along upper McAllister Creek, in the Nisqually Delta, south of Yelm and northwest of Clear Lake. There are also numerous wetlands located in the watershed near the City of Yelm, Clear Lake, and on Joint Base Lewis-McChord. The Nisqually National Wildlife Refuge is located at the confluence of the Nisqually River and the Puget Sound, creating the Nisqually River Delta, composed of mudflat/delta, emergent salt marsh, transition

fresh/salt, and riverine tidal. Historically, this estuary contained nearly 6 acres, but has been altered by the installation of dikes and development, reducing its size to 3 square miles. The 100-year floodplain is mapped around Alder Lake, as well as the entire Nisqually River. The 100-year floodplain also covers the Nisqually Delta.

2.3.2 Land Uses and Land Cover Estimates

The Nisqually watershed is unique to the Puget Sound in that despite development pressures from the nearby cities of Olympia, Lacey, Tacoma, and Yelm, it has remained relatively healthy (Department of Ecology, 2007). The predominant land covers of the Nisqually Basin are Evergreen forest (37%), Scrub and shrub (11%), and mixed forest (11%). High and medium development combined is below 2% of the land cover. Low intensity development accounts for 5% of land cover. Agriculture is also a principal land cover, composed of Pasture/Hay (12%) and cultivated crops (0.6%). The forest cover is extensive in the upper watershed and also within Fort Lewis. Much of the uplands is privately owned forestland. This portion of land is zoned Long Term Forestry, and shows signs of recent harvest by exhibiting a checkerboard pattern with evergreen forest and scrub/shrub throughout. The remainder of the watershed contains large areas of pasture/hay, as well as palustrine emergent wetlands and palustrine aquatic beds. Patches of evergreen, mixed, and deciduous forest cover are interspersed throughout the watershed (Thurston County, 2013a).

The total impervious area of the Nisqually Basin in Thurston County is around 7%, noting that this includes other landscape attributes that cannot be distinguished from impervious cover without field verification (e.g., shadowing) (Thurston County, 2013b). McAllister Creek and the Nisqually Bluff areas are most altered by development, with a total impervious area at 21% and 20%, respectively (Thurston County, 2013b).

The predominant land uses of the Nisqually Basin include undeveloped land (33%), designated forest land (22%), single family residential (16.3%) and agriculture (10%). This area is primarily zoned as rural residential one unit per five acres (43%), Military Reservation (15%), and Long Term Forestry (15%). The area is projected to experience an increase in residential development in the coming decades, and includes the two Urban Growth Areas of Lacey and Yelm (Thurston County, 2013a). Growth is anticipated to have an effect on water supply and natural resources around these two cities. A portion of the Nisqually Basin is protected under public and tribal ownership at Fort Lewis Military Reservation, Nisqually National Wildlife Refuge, Mt. Rainier National Park, and Nisqually Indian Reservation (Nisqually Indian Tribe, 2003).

The Nisqually Basin contains large areas zoned as Long Term Agriculture surrounding McAllister Creek, along the Nisqually River north of the Nisqually Indian reservation, along the Nisqually River south of Yelm and east of the Centralia Power Canal, and south of Yelm west of Yelm ditch. Agriculture may also occur on parcels zoned as rural, which is the primary designation in the mid-section (Thurston County, 2013a). The mid- and lower-sections of the basin contain recently permitted developments, subdivision lots, planned projects, and master planned communities scattered throughout. There are also many vacant single lots and vacant sub-dividable lands, especially in the Urban Growth Areas of Lacey and Yelm (Thurston Regional Planning Council, n.d.). Additionally, there are currently approximately 984

acres of land zoned as Nisqually Agriculture beginning just south of interstate-5 at Nisqually Cut Off Rd SE, east to Old Pacific Highway SE, south to McAllister Springs, and slightly west of McAllister Creek.

2.3.3 Critical Areas

Critical Aquifer Recharge Areas

The most vulnerable critical aquifer recharge areas are primarily along major rivers and tributaries within the Nisqually watershed. The Nisqually watershed is characterized by mostly category 1 critical aquifer recharge areas. The McAllister Geologically Sensitive area in the northwestern part of the watershed, south along Fort Lewis, and along the Nisqually River and Chehalis Canal surrounding Yelm are mostly category 1, extreme aquifer sensitivity (as per TCC Ch 24). A mosaic of category 1, 2, and 3 aquifers make up the remaining area surrounding many tributaries of the Nisqually River, including Yelm Creek south of Yelm and Raymond Ditch, near the McAllister Creek area.

High permeability soils are important for recharge. Recharge may be impaired in areas where impervious surfaces and non-forested vegetation covers high-permeability soils, including areas between McAllister Creek and the Nisqually River adjacent to Interstate 5, along and south of SR 51- on the east side of joint Base Lewis-McChord, within and east of the City of Yelm, and in smaller areas in the forested hills in the southern third of the WRIA.

The McAllister sub-basin is considered a highly productive aquifer. Groundwater easily passes through most of the deposits in this area, resulting in its high productivity. Recharging primarily occurs through infiltration of precipitation and secondarily as seepage from surface water (lakes, ponds and streams), septic systems, and irrigation return flow. Average groundwater recharge is estimated between 26.6 and 29.3 inches per year. The United States Geological Survey suggests that a significant amount of recharge is provided by Lake St. Clair, and that a significant amount of recharge originates as outflow from the Deschutes watershed (Nisqually Indian Tribe, 2003).

The McAllister Geologically Sensitive Area occurs in the McAllister sub-basin, in the northwestern area of the Nisqually watershed. There are several wells in this area, northwest of this area, and near Pacific Hwy SE just south of Steliacoom Road SE. There are other wellhead protection areas scattered throughout the watershed, particularly in Yelm and near State Hwy 507. The McAllister Geologically Sensitive Area provides for residential, commercial and agricultural uses and density that aims to minimize potential for contamination or significant loss in recharge capacity of a vulnerable groundwater aquifer. McAllister Springs is also in this area and is a very large, valley bottom spring and has been the primary source of drinking water for the City of Olympia since the 1940s.

There is a general lack of understanding regarding groundwater sources and the hydraulics continuity in the Nisqually watershed (Nisqually Indian Tribe, 2003). Some sub-basins within the watershed have good water supply while others have minimal supply or use a supply that impacts prairie streams or instream flows.

Waterbodies in the Nisqually watershed range from fair to good. The Water Resources Monitoring Report for 2009-2010 and 2010-2011 water years identified agricultural practices as a main contributor to fecal coliform bacteria contamination in Eaton Creek. Actions to improve Eaton Creek have included stream fencing, changes to animal-keeping practices, and restoration of the riparian area with native plants. McAllister Creek also experiences non-point pollution from agriculture, on-site sewage systems, and storm water runoff.

Wetlands

The majority of the Nisqually watershed is lowland with moderate elevation changes, shown by the presence of wetlands throughout the area (Thurston County, 2013a). The watershed includes the Nisqually National Wildlife Refuge at the meeting of the Nisqually River and the Nisqually Reach of the Puget Sound. This area of confluence is a biologically rich and diverse area that supports a variety of habitats, including estuary, freshwater wetlands and riparian woodlands.

Areas within the Nisqually watershed that have concentrations of wetlands include south of the City of Yelm, northwest of Clear Lake, and on Joint Base Lewis-McChord (Thurston County, 2013a). Depressional wetlands are located along the upper McAllister Creek, the Nisqually Delta, south of Lake St. Clair, the headwaters of Eaton Creek, south of the City of Yelm and northwest of Clear Lake. Loss of depressional wetlands can lead to impaired surface storage. Areas of depressional wetlands have been lost south of the City of Yelm and east of McAllister Creek. Most of the wetlands in WRIA 11 are located on areas of low permeability soils. The Interstate 5 corridor, a rail line, and areas of fill and diking are located within the wetland and floodplain areas associated with the Nisqually River and Delta (Thurston County, 2013a).

Geologic Hazard Areas

Sediment delivery via mass wasting (slope failure such as slides, flows, and falls) occurs in high mass wasting hazard areas and landslide areas, primarily mapped in the southern quarter of the Nisqually watershed, south of Elbow Lake. Mass wasting areas are also mapped in the hills around Alder Lake, east of Clear Lake, around Lake Saint Claire and along the Nisqually Hillside (Thurston County, 2013a). Process intensive areas for sediment delivery are areas of surface erosion, mass wasting, and in-channel erosion. Sediment delivery via surface erosion occurs in areas with steep slopes and erodible soils. Areas with steep slopes and erodible soils are most prevalent in the southern quarter of the Nisqually watershed, south of Toboton Creek and the Nisqually Hillside. Sediment delivery via in-channel erosion occurs in unconfined channels or channels with gradients less than 4%, including areas found along the Nisqually River, Yelm Creek, Yelm Ditch, Powell Creek, Thompson Creek (Nisqually) McAllister Creek, Toboton Creek, and other unnamed tributaries.

Frequently Flooded Areas

The 100-year flood plains are mapped on the Voluntary Stewardship Program Critical Area maps. The

100-year floodplain is mapped around Alder Lake, as well as the entire Nisqually River where the 100-year floodplain is extensive in numerous areas. The 100-year floodplain also covers the Nisqually Delta. South of Interstate 5, the 100-year floodplain is confined and closely parallel to McAllister Creek; to the north it drains into the Nisqually Delta. Toboton Creek, Yelm Creek, Thompson Creek (Nisqually) McAllister Creek, as well as Inman/Gehrke Lake are mapped within the 100-year floodplain. All of the marine shoreline within WRIA 11 is within the 100-year floodplain. Unconfined river channels occur along portions of the Nisqually River, Yelm Creek, Thompson Creek (Nisqually) McAllister Creek, Medicine Creek, Toboton Creek, and other unnamed tributaries- typically in areas of high permeability soils. The Nisqually Agriculture (NA) zone is located almost entirely within the 500-year floodplain and has relatively few development restrictions. Agricultural land use allows for important floodplain functions to still occur.

Fish and Wildlife Habitat Conservation Areas

Important fish habitats within the watershed are primarily native fish and salmonid habitat. All of Thurston County's marine nearshore is designated federal critical habitat for Puget Sound Chinook. The Nisqually Delta area is designated as federal critical habitat for Bull Trout. Much of the Nisqually River is designated as federal critical habitat for both Puget Sound Chinook and Bull Trout (Thurston County, 2013a). Restoration of the Nisqually National Wildlife Refuge began in 2009 with the removal of several dikes to inundate flooding. The restoration has been valuable to Chinook salmon, which depend on an estuarine environment as they transition from freshwater to saltwater. Studies have shown a positive species response, including more habitat availability, higher food support and faster growth rates after the restoration (Nisqually River Council, 2015).

In many tributaries of the Nisqually River, flows are insufficient to meet the needs of salmonids at certain times of the year. The amount of instream flow necessary to support fish varies with season and salmon life stage (Nisqually Indian Tribe, 2003). There is currently a large focus on restoration efforts in Ohop Creek near Eatonville and the Mashel River near LaGrande, both in Pierce County (Nisqually River Council, 2015).

According to WDFW's fishing and shellfishing map, Lake St. Clair and Clear Lake has mixed species with trout emphasis. The Nisqually River is the southernmost population of pink salmon in the Puget Sound. In recent years, counts have exceeded 1 million fish (WDFW, n.d.). McAllister Creek is mapped as supporting fall chinook, chum salmon, summer steelhead, winter steelhead, sockeye, pink salmon, sea-run cutthroat, and Coho salmon.

2.3.4 Agricultural Activities

The Nisqually Watershed contains approximately 40.58 square miles (25,969 acres) of agricultural activities. Areas zoned Long Term Agriculture are located surrounding McAllister Creek, along the Nisqually River north of the Nisqually Indian Reservation, south of Yelm and east of the Centralia Power Canal, and south of Yelm west of Yelm ditch. In addition, many areas zoned Rural Residential Resource

1/5 also contain agriculture uses, including farming, berries, Christmas trees, and pastureland. This zoning is extensive throughout the mid-section of the watershed, southeast of Yelm until Elbow and Clear Lake, where the zoning transitions into Long Term Forestry. Rural areas within the watershed are at risk to being converted to uses other than agriculture, such as residential development.

Approximately 23% (15,450 acres) of the 68,247 acres of farmland identified in the Thurston County Farmland Inventory report (2009) lies within the Nisqually Watershed. Principal crops grown outside the Nisqually Refuge Boundary include hay, corn, and Christmas tree farms (Fish and Wildlife Service, 2005). Other uses in the watershed include conventional and organic fruit farms, dairy, livestock operations, pasture and hay. There are also numerous small farm operations, representing the single fastest growing agricultural component of the watershed (National Resources Conservation Service, 2012).

2.3.5 Intersection: Agriculture and Critical Areas

Agricultural activities are generally located in the low-lying valleys adjacent to the Nisqually River and its major tributaries and within or near frequently flooded areas. There is concentrated agriculture activity near central-east Thurston County in the bald hills area between the Nisqually River, Centralia canal, and Yelm Creek, and also in the northwestern portion of the watershed near McAllister Creek and surrounding the Nisqually National Wildlife Refuge. These agricultural areas intersect primarily with Critical Aquifer Recharge Areas and Wildlife Habitat Conservation Areas. See section 1.1 for more detailed information on agriculture intersecting with critical areas in Thurston County. Agriculture intersecting with critical areas specific to the Nisqually watershed in Thurston County is analyzed below in Table 15.

Table 15. Intersection of Agricultural Activities and Critical Areas with the Nisqually Watershed

Critical Area	Agricultural Activities Total Acreage	Percentage of Intersection
Total	*26,001*	--
Wildlife Habitat Conservation Areas	22,092	63 %
Geologic Hazard Areas	4,224	16 %
Critical Aquifer Recharge Areas	25,928	99 %
Frequently Flooded Areas (FEMA Flood Zones)	2,913	11 %
Wetlands	3,163	12 %

The 2009 Farmland Inventory Report found that an estimated 50% of the farmland in Thurston County contains, or is adjacent to, areas that provide important fish and wildlife habitat (Fisher & Mitchell, 2009). The Nisqually watershed estimated a higher number than that average, with 63.1% of agricultural activities intersecting with wildlife habitat conservation areas.

As indicated by a countywide study by the Washington State Department of Agriculture (WSDA) and the Washington State Department of Transportation (WSDOT), agricultural sites may be likely to have Mazama pocket gopher mounds either present or immediately adjacent to current agricultural practices, whereas others may have little or no use by Mazama pocket gophers (Cook & Beale, 2014). There are 16,394 acres (63%) of agricultural activities within the Nisqually watershed that intersect with gopher soils. Approximately 5% of those are on high preference soils, 20% on medium preference soils, and 75% on low preference soils. This indicates that Mazama pocket gophers are present within or adjacent to many of the areas where agricultural activities are currently being conducted in the Nisqually Watershed.

2.3.6 Existing Issues and Strategies

2.3.6.1 Water Quality

The streams and water bodies in the Nisqually Watershed have had a number of water quality violations that have placed them on the federal Clean Water Act 303(d) list of polluted waters for high levels of phosphorus and pesticides, high water temperatures, high pH, and low levels of dissolved oxygen (Ecology, 2012). Three of the waterbodies – Clear Lake for phosphorus, Mashel River for temperature and Ohop Creek for DO – are listed as category 5 for 2012, meaning they are polluted waters that require a TMDL or other WQI project. The Nisqually River is listed as category 4C and is impaired by a non-pollutant, i.e. invasive exotic species. Five waterbodies – McAllister Creek, Muck Creek, the Nisqually Reach at Drayton Passage, Ohop Creek, and an unnamed creek – are listed as category 4A and have an approved TMDL in place that in 2012 was actively being implemented. Seven waterbodies are listed as category 2, a water of concern that doesn't yet require a TMDL or WQI. Three waterbodies are listed as category 1 – McAllister Creek, the Nisqually Reach at Drayton Passage, and the Nisqually River; placement in this category means that the waterbody meets standards for pollutants that were tested.

Agriculture within the Nisqually Watershed is listed as a primary contributor to fecal contamination, along with on-site septic systems, storm water runoff, and wildlife. There are numerous water quality monitoring programs ongoing in the watershed.

Although the Nisqually River is one of the least developed in the southern Puget Sound, water quality is still a concern with fecal coliform bacteria concentrations exceeding standards for commercial shellfish harvest. Primary issues identified for clean-up include on-site septic systems in several areas along McAllister Creek and the Nisqually Reach, the commercial area near Interstate 5, and other residential areas; agricultural sources identified to contribute to pollution in the lower reaches of McAllister Creek, Red Salmon Creek, and Ohop Creek, including proper maintenance of tide gates to lessen pollution resulting from back-flooding; addressing storm water issues in the City of Eatonville, west bank of McAllister Creek, and Interstate 5 outfall to McAllister Creek. Additionally, addressing issues such as animal waste, fertilizer application, storm water, on-site septic, agricultural sources, and yard care products is necessary to improve surface water and ground water sources (Ecology, 2005).

2.3.6.1.1 Recommendations for Water Quality Issues

Strategies for addressing the above issues includes regulatory authority for on-site septic systems under the Thurston County Health Department and working with the Thurston Conservation District to reduce pollution by improving agricultural practices through a voluntary, technical assistance approach program with landowners, designing farm plans and best management practices that manage nutrients to prevent runoff.

Recommendations in the Phase IV Nisqually Implementation Plan (2007) include: Department of Ecology assure consistency between water quality and water resource statutes to encourage reclaimed water projects; implementing a watershed-wide Water Quality Monitoring Plan; convene a workgroup to address potential inconsistencies in handling pollutants between federal and state agencies and utilities; address land uses that may threaten watershed health and; ensure adequate water quality monitoring of groundwater in designated critical aquifer recharge areas; creation of a Nisqually Water Quality Data System to store, compare and access water quality through a GIS spatial interface; evaluate land use impacts on water quality.

The Nisqually Watershed Management Plan (2003) outlines further recommendations and strategies to protect water quality: Develop and implement water quality monitoring plans for Mashel-Ohop sub-basins; investigate use of the Source Water Protection Assessment Program (SWAP) to protect the Town of Eatonville's water supply and water quality of the Mashel sub-basin with actions including delineating the source water protection area, conducting a contaminant source inventory, and determining the susceptibility of the public water supply to contamination from the inventoried sources; address long-term impacts of land use on water quality with a comprehensive, long-term water quality monitoring plan.

The procedure of addressing water quality issues in the Nisqually Watershed within Thurston County is the same as for the Chehalis Watershed for both the Department of Ecology and Thurston County Environmental Health Codes (*see section 2.1.6.1*). The Department of Ecology works with the Thurston Conservation District (TCD) in addressing agricultural pollution problems. Likewise, Thurston County's Environmental Health Codes require that the landowner responsible for pollution problems seek technical assistance within 15 days of the violation.

The TMDL Water Quality Implementation Plan (2007) lists several strategies for cleaning up the Nisqually watershed focus areas of the Nisqually Reach, McAllister Creek, Ohop Creek, Red Salmon and Lynch Creek. This table (Table 16) has been shortened and modified to show only focus areas within Thurston County (Nisqually Reach and McAllister Creek).

Table 16. Nisqually TMDL Implementation Actions[20]

Action	Schedule	Focus Areas	
		Nisqually Reach	McAllister Creek
Natural Resources Conservation Service (NRCS)			
Work with the Thurston Conservation District to administer the 2002 Farm Bill	Ongoing	X	X
Nisqually Reach Shellfish Protection District citizen advisory group			
Oversee implementation items in the Henderson Inlet and Nisqually Reach Shellfish Protection Districts' implementation work plan, specifically the on-site sewage system and storm water recommendations	Ongoing	X	X
Nisqually Tribe			
Removal of animals on the Braget farm to eliminate access to Wash Creek	2007	X	
Perform and coordinate monitoring in the Nisqually River Basin	As needed	X	X
Coordinate monitoring activities in the Nisqually River Basin	Ongoing	X	X
Nisqually River Council			
Organize and facilitate an annual adaptive management meeting beginning in 2008 to discuss progress and identify alternatives if needed	2008 and annually thereafter	X	X
Puget Sound Water Quality Action Team			
Provide technical and financial assistance to control pollution from on-site sewage systems, farm animal wastes and storm water runoff	Ongoing		X
Administer grant funds for public involvement and education projects	Ongoing		X
Thurston Conservation District			
Animal access to ditches and waterways that drain tide gates 9, 13, 12, 4, and 5 has been restricted and fencing is done. Planting completed in 2006. This will restrict animal access in both the creek and the ditch	2006		X
Work with landowners in the Nisqually Basin to implement BMPs and develop conservation plans	Ongoing		X
Promote and/or administer financial assistance programs for implementing riparian livestock exclusion fencing and plantings as well as other practices addressing water quality issues	Ongoing		X

[20] This table is adapted from *Table 2* in the "*Nisqually River Basin Water Quality Implementation Plan (WQIP)*" (2007). For more information and the full table, visit https://fortress.wa.gov/ecy/publications/documents/0710016.pdf

2.3.6.2 Water Quantity

The Nisqually Watershed is one of the most intensely farmed basins in western Washington. On average, annual precipitation in the watershed ranges from 40 inches in the lower watershed to over 120 inches in the Cascade Mountains. Most of the precipitation arrives during the winter months when water demands are lowest. During summer, stream flows are low and dependent on groundwater inflow. Water demand is highest in the summertime when the supply is at its lowest with less rainfall and snowpack (Ecology, 2012).

There is limited water available within the watershed for new uses. The instream flow rule established for WRIA 11 by Ecology under the Instream Resource Protection Program (IRPP) (Chapter 173-511 WAC) closes and partially closes numerous streams to any new appropriations, as well as adopts instream flows on other streams and creeks. Instream flows are currently insufficient to meet the needs of salmonids in many tributaries of the Nisqually River at certain times of year. Limited instream flow and current regulatory barriers are not enabling applicants to acquire water rights throughout the State, which can result in an inability to supply water for growth (Nisqually Indian Tribe, 2003). Yelm, McAllister, Eaton, and Thompson Creeks (only considering those in Thurston County) are currently closed year-round to further water appropriation. Additionally Toboton creek in Thurston County is a tributary of the Nisqually River that has seasonal closures. This is currently an issue for Yelm, Olympia and Lacey. There is a general lack of knowledge regarding water availability and what amount is not consumptive of surface flows in each sub-basin. Flow regulations in WRIA 11 consist of minimum instream flow levels set at three locations on the Nisqually River, one location on the bypass reach, and at the USGS gauge on the Mashel River.

Existing issues within the watershed are identified in the Nisqually Watershed Management Plan (2003). Yelm, Lacey and Eatonville predict water supply shortfalls within the next 10 years and are having difficulty acquiring water rights to new groundwater supply. There is also a general lack of information and understanding regarding groundwater sources and hydraulic continuity, which makes it difficult to assess groundwater information required for water right decision-making. Current scientific information on the effects of exempt wells on surface water and instream flows is also inconsistent. Furthermore, groundwater divides do not necessarily follow WRIA boundaries and there is a need to identify all critical recharge areas to ensure they are adequately protecting water quality and water quantity.

2.3.6.2.1 Recommendations for Water Quality Issues

Recommendations are made in the Nisqually Implementation Plan (2007) to protect water rights in regards to agriculture. First, adequate water supply should be retained on and provided to designated agricultural land of long-term commercial significance and other important agricultural areas. Secondly, Ecology should not grant permits for transfers of existing water rights from designated agricultural lands, unless long-term arrangements are made for a suitable surrogate water supply to maintain agricultural use.

Recommendations in the Nisqually Watershed Management Plan (2003) consider that some sub-basins appear to have prolific supply while others have minimal supply and/or use of that supply impacts prairie streams or instream flows. Results from groundwater modeling in the McAllister sub-basin suggest that there is a large quantity of groundwater that discharges from WRIA 11, directly to Puget Sound, from the Nisqually Aquifer. This aquifer may be a potential source of potable water on a regional scale. The Nisqually Indian Tribe holds a reserved water right and maintains senior rights to these waters, but will initiate discussion to determine water availability for appropriations. A shift from Olympia's water withdrawal from McAllister Springs to a deeper groundwater source will likely improve water quality, fish habitat and instream flows in McAllister Creek. The City of Olympia holds water right certificates for the diversion of up to 19.6 million gallons per day from McAllister Springs and a permit to divert up to 6.5 million gallons per day from Abbott Springs (Nisqually Indian Tribe, 2003). To meet future demands, the City of Olympia initiated the development of a replacement groundwater source for McAllister Springs, referred to as McAllister Wellfield.

Recommended actions from the Nisqually Watershed Management Plan (2003) include: identify the Nisqually Aquifer as a possible source for a regional water supply to be used to supply water in multiple sub-basins in WRIA 11; investigate the technical feasibility of development of a regional water supply in the McAllister Sub-basin that does not have a negative impact to existing water right holders, and has the potential to cause the least impact to, or improve, the quality and quantity of surface waters; develop a policy for coordination and congruence for groundwater that does not follow the WRIA boundaries; address locations of groundwater divides through a joint study.

Recommended actions for water rights include: Ecology Water Resources Staff batch processes water right applications by sub-basin in the Nisqually Watershed when data available for processing is considered adequate; Department of Ecology be staffed at a level that ensures timely responses to water right applications; mitigation strategies for water right holders and applicants including, but not limited to direct augmentation of surface water using groundwater, aquifer storage and recovery of reclaimed and surface water, storm water improvements, habitat enhancements on and off site, and putting active water rights into trust; pursue a policy that provides additional water rights equal to the amount used for aquifer recharge; the Department of Ecology assure consistency between water quality and water resources statutes; study to better understand the basis of closures and current instream flow conditions; investigate the potential for purchase, sale or lease of water rights; and the development of a watershed-wide water balance to better understand availability.

2.3.6.3 Fish and Wildlife Habitat

The primary focus for fish habitat is on salmon and steelhead stocks within the watershed, and factors that are limiting to salmonid recover. Major habitat limiting factors are described in the Salmon and Steelhead Habitat Limiting Factors for Water Resources Inventory Area 11 report (Kerwin, 1999). The categories of habitat limiting factors include: loss of access to spawning and rearing habitat, floodplain conditions, streambed sediment conditions, riparian conditions, water quality, water quantity, estuarine and nearshore habitat, and lake habitat. These categories overlap with each other and one habitat problem could impact more than one habitat limiting factor category.

Salmonid resources in the Nisqually watershed have been adversely impacted through a variety of land use practices, including commercial timber, agriculture, and residential uses. Construction of roads and timber harvest in the upper watershed has resulted in an increase of mass wasting and sediment deposition in streams. Additionally, conversion of lands in floodplains from agriculture to rural has resulted in floodplain constriction, increased sedimentation, increased storm water runoff, and loss of habitat functions provided by riparian buffers (Kerwin, 1999). Surface and groundwater withdrawals in WRIA 11 for irrigation and domestic use reduce the availability of instream flow during adult salmon upstream migration and spawning. Stream habitat and productivity is compromised by low instream flow, increased runoff, decreased infiltration of precipitation, and sediment deposition. Agriculture can also contribute to non-point source pollution of streams used for habitat.

Similar to the Chehalis Watershed, focus for terrestrial and upland wildlife habitat issues within the Nisqually Watershed is on prairie species of concern, which are either currently listed under the Endangered Species Act (ESA) or are candidates for the listing. Some of these species include Taylor's checkerspot butterfly, the Streaked horned lark, the Mazama pocket gopher, and the Oregon spotted frog. Prairie habitat is at risk of continued loss to development, incompatible agriculture, habitat fragmentation, predation and degradation. Much of the decline of these species is associated with prairie habitat loss, including conversion to other uses or being lost to encroachment of trees, nonnative grasses and invasive species such as Scot's Broom. Historically, the Nisqually watershed had prairie land that was regularly burned, which inhibited encroachment of trees into these areas. With the lack of regular burning, former prairie and oak areas are now fir-dominated (Nisqually Indian Tribe, 2003). This change in vegetation has an effect on streamflow quantity and timing. Prairies also provide crucial groundwater recharge areas, improving water quality for cities, wells, and wildlife. Very little high quality prairie habitat still exists within the watershed. The Prairie Habitat Conservation Plan is currently being developed by Thurston County and the U.S. Fish and Wildlife to protect a variety of prairie species (*see section 2.1.6.3 for more information*).

2.3.6.3.1 Future Fish and Wildlife Habitat Concerns – Climate Change

Climate change is proving to be an issue to salmonid populations and other aquatic species in the Nisqually watershed. Drought, wildfires, spring flooding and poor snowpack causes the aquatic environment to change rapidly. The past year has had the highest temperatures in adjacent oceans ever recorded (Nisqually River Council, 2015). In 2015 Nisqually River Salmon Runs, less than 200,000 of a projected 1 million Pink salmon returned, and only 24,000 Chinook were forecasted compared to previous years of more than 30,000 (Nisqually River Council, 2015). Stream temperatures in 2015 were some reached up to 70° F and were some of the worst conditions for salmon seen yet, partially due to little snowpack in the upper watershed that acts as a storage reservoir for cooler water throughout spring and summer (Nisqually River Council, 2015). These high temperatures are a threat to salmon that return to the rivers and inhibit migration, increase vulnerability to predators, and promote disease.

2.3.6.3.2 Recommendations for Fish and Wildlife Habitat Issues

The Nisqually Watershed Chinook Salmon Recovery Plan (2008) proposes habitat projects expected to double the number of naturally produced Chinook that return to the watershed and increase the life history of the population from its current 80% to 93% historic diversity. Habitat protection and development in this plan includes Interstate-5 fill removal feasibility analysis, mainstem off-channel habitat project development, riparian vegetation assessment and project development, and large woody debris enhancement in the mainstem Nisqually (Puget Sound Partnership, 2008).

The Nisqually Stewardship Plan (2012) identifies actions, objectives, and goals for wildlife management. Recommended actions include: develop a watershed-specific game management plan, including prioritized actions; negotiate access issues with private landowners for wildlife hunting and viewing; identify and map elk range; assess critical habitat for elk over-wintering and calving; develop a Nisqually Elk Corridor Team; identify and map areas important to populations of migratory waterfowl; develop a Nisqually bird stewardship program; identify non-game species and habitat needs in the watershed; and develop a non-game plan. Goals for 2030 include protect and expand wildlife habitat, place a game management plan, and implement all actions for non-game species.

2.3.6.4 Flood Hazards

Historic documentation of the Nisqually River shows a long history of winter flooding, along with glacial outburst floods that occur when ice shelves burst, also known as Jokulhaups. Flooding along the Nisqually River is primarily related to the amount of water released from LaGrande Dam (Pierce County near Southeast Thurston County). This determines the amount of water that then enters Alder Lake and is released from Alder Dam. Minor floods of low-lying roads and pasturelands occurs when the flow rate of La Grande exceeds 8,000 cubic feet per second (cfs). Moderate flooding occurs when the flow rate exceeds 15,000 cfs; at this stage, individual residences are threatened along with flooding of roads and farms and damage along river banks. Major flooding occurs when the flow rate tops 16,500 cfs; this flood stage floods roads, farms and residential facilities, the Nisqually River and tributaries[21]. Previous to the construction of two major dams on the Nisqually River, flood events would have impacted the entire river at a much greater extent than they do today.

2.3.6.4.1 Future Flood Hazard Concerns

Climate change is anticipated to escalate the likelihood of flooding by increasing the rate of snowmelt and increasing winter rainfall while decreasing snowpack. Higher winter rains is expected to increase flooding and heavy erosion, impact water quality and pose risk to public health, safety and infrastructure. In a climate change study done by TRPC (2016), streamflow volume associated with 100-year floodplain flood events in the Nisqually River is expected to see an 18% increase by 2080. Flooding

[21] For more information on flooding in the Nisqually River, visit *Thurston County Emergency Management*: http://www.co.thurston.wa.us/em/PressRelease/Rivers/Nisqually.htm

is currently identified as the most costly natural disaster in Thurston County, costing over $10 million on uninsured property loss between 2007 and 2009 (Greene, 2014). In addition to potential infrastructure costs, an increase in winter flooding may affect agricultural practices and cause crop and livestock damages.

Historical crests for the Nisqually River at McKenna include a major flood of 17.3 feet at 50,000 cfs in February of 1996, a moderate flood of 13 feet at 23,300 cfs in January 1965, and several minor floods in 1995 and 1990. The February 1996 flood was one of the most devastating floods on record for Thurston County. Every major river and stream within the County crested its banks during this flood event. Several homes were declared uninhabitable, 47 homes were destroyed in the Nisqually Valley, nearly 1,000 people were evacuated from their homes countywide, more than 300 sections of County roads were damaged, Wa He Lut Indian Affairs School was destroyed by the Nisqually River, the north-south rail line at the Pierce County border was closed due to flooding, nearly $2 million was spent in County response and recovery, and nearly $20 million was spend for other government response and recovery (Greene, 2014).

2.3.6.4.2 Recommendations for Flood Hazard Issues

Agricultural lands provide a variety of important services, including flood control for the area. Long Term Agriculture is the greatest land use within the 100-Year Floodplain, at 5,923.38 acres or 18.25% countywide (Greene, 2014). Conversion of agricultural lands to developed areas in the floodplain can inhibit proper floodplain functions. Services such as the availability of water and flood control are valued at between $280 million and $4 billion, yet not enough money is being directed at protecting and restoring these services within the Nisqually watershed (Nisqually River Council, 2014).

The Thurston County Flood Hazard Mitigation Plan (2013) lists several hazard mitigation initiatives for the County. Some hazard mitigation initiatives specific to the Nisqually Watershed include: 1) Collaborate with Pierce County and Tacoma Power to identify appropriate operational procedures of Alder Lake Dam that will minimize flood risk on the Nisqually River; 2) Obtain digital data and create GIS maps of flood inundation possible from the Alder and LaGrande Dams; and 3) Develop evacuation plans for communities and residents downstream from the Nisqually dams.

2.3.6.5 Loss of Farmland

The Nisqually Watershed has experienced tremendous growth, reflective of greater Thurston County with over a 230% increase in population between 1970 and 2011[22]. Growth is expected to infringe on rural communities within the watershed in the coming years, but not equally among all communities. Yelm is anticipated to have a much higher increase in population than other communities within the Nisqually watershed, growing from a population of 6,848 in2010 to a projected 14,050 in 2020 and

[22] U.S. Department of Commerce. (Multiple Years). Census Bureau, American Community Survey Office, Washington, D.C

26,285 by 2035 (Greene, 2014). This compares to the Nisqually Reservation, which sees a slower rate of growth from 595 in 2010 to a projected 985 in 2020 and 1,120 by 2035 (Greene, 2014).

The lower watershed communities of Yelm, McKenna and Roy have had higher success with maintaining agriculture than other areas in the watershed due to fertile soils, milder weather, and nearby access to urban areas. Several working farms still exist in these areas, however these communities largely serve now as "bedroom communities" for those who commute to Joint Base Lewis-McChord, Olympia, Tacoma and Seattle (Greene, 2014). As population is projected to increase in Thurston County, these communities are expected to see rural expansion that infringes on agricultural lands.

The Community Farmland Trust (2009) suggests that a majority of Thurston County's farmland is at risk of being converted to other uses, indicated by nearly 75% of farmland within 3 miles of an Urban Growth Area, only 51% of farmland enrolled in the Open Space tax program, the majority of farmland lying outside of a Long Term Agricultural zone, an average age of 57 years old for principal farm operators, and a majority of rented land among farms. The Nisqually watershed has two Urban Growth Areas within its boundaries in Thurston County: the Yelm UGA, which is entirely within the watershed, and small portions of the Lacey UGA that overlap the northwestern edge of the watershed. Nisqually Agriculture borders the eastern side of the Lacey UGA, and several Long Term Agriculture patches exist near the Yelm UGA.

2.3.6.5.1 Recommendations for Farmland Preservation

Current efforts and existing strategies to protect farmland in this watershed include Long Term Agriculture and Nisqually Agriculture zones. Currently from the 2015 Thurston County zoning layer, 4,423.51 acres of these two zones occur within the Nisqually watershed, which is 5.4% of the watershed. Additionally, Purchase of Development Rights (PDR) and Transfer of Development Rights (TDR) programs exist for Thurston County in an effort to preserve farmland, though continued funding has been a challenge. Development rights were purchased on roughly 900 acres of farmland in northeastern Thurston County near the Nisqually Delta in the early 1990's, but the program has had trouble receiving annual funding to continue (Fisher, 2009).

Other measures within the county to protect farmland include agricultural and conservation easements, rural resource cluster development, open space taxation programs for current use and farm and agricultural classification, and conservation futures. Five land trusts hold easements in Thurston County, including the Capitol Land Trust, Nisqually Land Trust, Northwest Rangeland Trust, PCC Farmland Trust, and South of the Sound Community Farm Land Trust (TRPC, n.d.). Of those land trusts, the Nisqually Land Trust and the Northwest Rangeland Trust hold conservation easements in the Nisqually Watershed. In 2013, the Northwest Rangeland Trust closed on a conservation easement on 142 acres of agricultural land belonging to the McKenzie Family near Yelm, funded in part by Conservation Futures (NWRT, 2016). This easement is privately owned for cattle use, and will remain an agricultural property, though it is a desired property for residential development (NWRT, 2016).

2.4 Kennedy-Goldsborough Watershed Overview

2.4.1 Geography and Hydrology

The Kennedy-Goldsborough Watershed (WRIA 14) is located in the northwestern part of the county. The watershed covers 381 square miles in the southwest Puget Sound, with approximately 48 square miles in Thurston County (about 12.5% of the watershed). This watershed contains 9% of the County, making it the smallest watershed when combining the upper and lower Chehalis (Thurston County, 2013). The majority of this watershed is located on the Steamboat Island peninsula and also in the forested hills of the Black Hills area. Kennedy Creek, Summit Lake, Perry Creek and Schneider Creek are within the watershed. Kennedy Creek is the largest stream in the watershed, with a mean annual flow of 125 cfs. Approximately 20% of stream flows are supported by a relatively constant year-round discharge of groundwater as base flow (Golder Associates, 2002).

Areas of higher precipitation and rain-on-snow areas are important for water delivery to the watershed. The southwest boundary of WRIA 14 falls within the Black Hills and contains large areas mapped as “rain-dominated zones” as well as areas of “rain-on-snow zones”. The Black Hills have the highest levels of annual precipitation in Thurston County, at 127 inches annually. Much of the precipitation that falls in the Black Hills runs off because of impermeable basalt (Thurston County, 2013).

The aquifer system in WRIA 14 consists of layered sediments deposited by glaciers 10,000-14,000 years ago. These sediments cover most of the surface, with the exception of the Black Hills which is primarily basalt (Plateau Technical Communication Services, 2006). The basalt bedrock also lies under the glacial sediments, forming a hard boundary to the aquifer system (Plateau Technical Communication Services, 2006).

Surface water storage areas within the watershed include areas containing depressional wetlands, wetlands, lakes, 100-year floodplain, and unconfined river channels. Summit Lake is the only lake within the watershed. Two unnamed ponds are also within the watershed and are the only wetlands exceeding the 20 acres threshold to qualify under SMA jurisdiction. There are other numerous, small palustrine wetlands and depressional wetlands scattered through the center of Steamboat Island Peninsula. Depressional wetlands are associated with Schneider Creek, the upper reach of Kennedy Creek, and small streams that drain to Totted and Eld Inlets.

A small area of the 100-year floodplain is mapped at the west end of Summit Lake. Unconfined river channels are found along the upper reach of Kennedy Creek and some of its tributaries, along the entirety of Schneider Creek and its tributaries, and several of the creeks draining to Young Cove, Frye Cove, and the inlet north of Burns Cove (Thurston County, 2013). The majority of the watershed is on low permeability soils, important to shallow subsurface flows. Areas of high permeability are important for recharge, with the longest stretches occurring around Kennedy Creek and Schneider Creek. Other areas of high permeability soils include areas adjacent to Gallagher Cove, Madrona Beach, and under several wetland and stream complexes that drain to Totten and Eld inlets.

2.4.2 Land Uses and Land Cover Estimates

The predominant land covers in the Kennedy-Goldsborough are evergreen forest (44.2%), mixed forest (15.5%), and scrub/shrub (13.5%). There is 3.7% of low intensity development land cover (Thurston County, 2013). Land use in WRIA 14 is 37% undeveloped land, 27% designated forest land, and 20% single family residential. Predominant zoning in the watershed include Long Term Forestry at 47% and Rural Residential 1 unit per 5 acres at 45% (Thurston County, 2013). Salmonid habitat has been found to be degraded by land use practices associated with forest management, removal of large woody debris (LWD), development, and agriculture (Plateau Technical Communication Services, 2006).

Thurston Regional Planning Council analysis of future land use within this watershed projects that the area will experience an increase in both residential and commercial development. Areas that will likely see increased development include on the Steamboat Island Peninsula, along Mud Bay, around Summit Lake, Highway 101 and Highway 8 (Thurston County, 2013). The area south of Highway 101 will remain in forestry use.

The major roads within the Kennedy-Goldsborough watershed include Highway 101 and Highway 8. In the watershed, south of Highway 101 and north of Highway 8, the roads are fairly limited to a few logging roads and roads surrounding Summit Lake. North of Highway 101, there are more frequent roads, with the highest concentration occurring at the tip of the Steamboat Island Peninsula. Numerous culverts are located around Summit Lake, along Schneider Creek south of Highway 101, along Steamboat Island Road, and along the waterfront near Burns Point, Gallagher Cove, Flapjack Point and Young Cove, Madrona Beach and south into Mud Bay and Perry Creek.

2.4.3 Critical Areas

Critical Aquifer Recharge Areas

The most vulnerable critical aquifer recharge areas within the Kennedy-Goldsborough watershed lie primarily along streams and major tributaries. Most of this watershed is categorized by category 3 critical aquifer recharge areas, with large patches of category 2 and small areas of category 1 critical aquifer recharge areas. Category 1 critical aquifer recharge areas are located along Highway 8 around Perry Creek and Kennedy Creek, surrounding Schneider Creek and the west portion of Highway 101 in Thurston County, along Sunrise Beach, and along streams draining to Young Cove and Edgewater Beach. The remainder of the watershed is a mosaic of category 2 and 3 aquifers.

High permeability soils are important for recharge. The longest stretches of high permeability soils within the watershed include Kennedy Creek and Schneider Creek. High permeability soils are also found adjacent to Gallagher Cove, next to Madrona Beach, and under wetland and stream complexes that drain to Totten and Eld inlets (Thurston County, 2013). Recharge may be impaired by impervious surfaces and non-forested vegetation on areas with high permeability soils. Because there are not many high permeability soils within the Kennedy-Goldsborough watershed in Thurston County, there are not many areas of impaired recharge.

The aquifer system within this watershed is composed of layered sediments deposited by glaciers nearly 10,000 to 14,000 years ago, excluding the Black Hills in the southwestern portion, which is made of basalt (Plateau Technical Communication Services, 2006). The basalt forms a hard boundary to the aquifer system.

The Thurston County Water Resources Monitoring Report for 2009-2010 and 2010-2011 water years identified major issues for the Eld Watershed and Totten/Little Skookum Inlet Watershed (both within the Kennedy-Goldsborough watershed). Major issues in the Eld Watershed (Green Cove Creek, McLane Creek and Perry Creek) include urban development, stormwater runoff, agricultural nonpoint sources and forest practices and on-site septic systems. The Totten Watershed (Kennedy Creek, Schneider Creek and Summit Lake) has major issues of animal keeping practices, agriculture practices, logging practices, stream-side development, septic systems, and residential land uses.

Wetlands

Estuarine emergent wetlands are scattered along both shorelines of the Steamboat Island Peninsula, with concentrations in the coves. Unnamed ponds 1 and 2 are the only wetlands that exceed the 20 acre threshold and therefore qualify under SMA jurisdiction. There are numerous small, Palustrine wetlands and depressional wetlands scattered throughout the center of Steamboat Island peninsula. Depressional wetlands also exist around Schneider Creek, the upper reach of Kennedy Creek, and with the small streams that drain to Totten and Eld Inlets. Surface storage and sediment storage may be impaired by the loss of depressional wetlands.

Geologic Hazard Areas

Sediment delivery via mass wasting occurs in high mass wasting areas and landslide areas. There are substantial areas of potential mass wasting in the Black Hills south of Highway 101, and along the tributaries and main stems of Kennedy and Schneider Creeks, Perry Creek, and Summit Lake. North of Highway 101, mass wasting areas exist primarily along the shoreline, with more concentrated areas at the base of Oyster Bay, along Elizan Beach, north of Gallagher Cove to the tip of Steamboat Island, at Hunter Point and south through Edgewater Beach, around Sanderson Harbor, Frye Cove, and north of Sunrise Beach. However, there are few non-forested areas on high mass wasting hazard areas, indicating minimal impairment to large woody debris delivery to the marine shoreline.

Process intensive areas for sediment delivery include areas of surface erosion, mass wasting, and in-channel erosion. Sediment delivery via mass wasting occurs in areas with steep slopes and erodible soils. There is a large concentration of these areas south of Highway 8 in the hills of the Capitol Forest. Surface erosion is limited in the remainder of the watershed to small areas around lower Kennedy Creek, lower Schneider Creek and some of the unnamed streams draining to Totten and Eld Inlets (Thurston County, 2013).

Frequently Flooded Areas

The 100-year flood plain is mapped along the marine shoreline within the watershed, the west end of

Summit Lake, the upper Kennedy Creek and a portion of mid-Kennedy Creek (Thurston County, 2013). Floodplain connectivity in the watershed is generally characterized as good to fair. Discharge in the watershed may be impaired by impervious surface and non-forested vegetation on high permeability soils that intersect with floodplains. Goldsborough Creek had major floods in 1923, 1932, and 1935 before it was armored to protect the City of Shelton (Kuttel, 2002).

Fish and Wildlife Habitat Conservation Areas

Important fish habitat areas are primarily native fish and salmonid habitat. Streams in the Kennedy-Goldsborough watershed are well suited to the production of Chum salmon, which migrate to sea immediately following emergence (Kuttel, 2002). The majority of streams, with the exception of the southern portion of the basin draining the Black Hills, flow through low gradient terrain dominated by glacial till and outwash deposited as the Vashon Glacier retreated and led to many lake and bog formations. The low gradient streams are best suited for the production of chum, coho, and coastal cutthroat. These species also use nearshore areas, along with Chinook salmon. Water quality issues, including excessive sediment in streams, has created unfavorable habitat conditions for salmonids (Plateau Technical Communication Services, 2006). The watershed is also home to many shellfish species. Limiting factors and sources of degradation for fish and shellfish habitat include land use practices associated with forest management, removal of large woody debris, development, agriculture, culvert problems, riparian habitat degradation, loss of channel complexity, and high sedimentation levels (Plateau Technical Communication Services, 2006).

Other important wildlife habitat conservation areas include upland and prairie habitats. Prairie soils in the watershed are located along parts of Highway 8, south of Highway 101 in the northwestern part of the County near Totten Inlet, north of 101 and Schneider Creek, in patches surrounding Young Cove, and the northeast tip of Steamboat Island. There are currently no Mazama pocket gopher soils mapped in the Kennedy-Goldsborough watershed.

2.4.4 Agricultural Activities

The Kennedy-Goldsborough Watershed contains the least acreage of agricultural activities compared to other watersheds within the county. Only 5% of the watershed contains land designated as agricultural activities – 1,572 agricultural acres out of 30,500 total acres of land. Agricultural activities are scattered throughout the Steamboat Island Peninsula. There are no areas of Long Term Agriculture within this watershed. Most of the agricultural activity within the watershed occurs in areas zoned as Rural Residential/Resource, 1 unit per 5 acres (RRR 1/5).

2.4.5 Intersection: Agriculture and Critical Areas

Areas of agricultural activities occur on steamboat island peninsula within the Kennedy-Goldsborough watershed, mostly in areas zoned as RRR 1/5. There are several smaller tracts of agriculture along

Schneider Creek and Schneider's Prairie just Northeast of Highway 101. Agriculture activities intersected with critical areas continue along the northern area of Highway 101 up towards Oyster Bay. Other areas of agricultural activities include along Steamboat Island Road Northwest, east of Steamboat Island Rd NW and just north along Young Cove, west of Frye Cove, south of Edgewater Beach along the shoreline, Indigo Farms off of Hunter Point Rd NW, and at Carlyon Beach.

There are a few intersections with Wildlife Habitat in the Kennedy-Goldsborough Watershed, including a small edge of a tract near Oyster Bay Road NW and Steamboat Island Road NW. The remainder of the agricultural activities that intersect with critical areas in this watershed lie primarily in Critical Aquifer Recharge Areas, along with some wetlands overlap. Few tracts also intersect with Geologic Hazard Areas, including just north of Highway 101 along Madrona Beach, along the edges of a tract along Oyster Bay Road NW, and on the western side of the peninsula at the end of Elizan Drive Northwest.

Table 17. Intersection of Agricultural Activities and Critical Areas with the Kennedy-Goldsborough Watershed

Critical Area	Agricultural Activities Total Acreage	Percentage of Intersection
Total	*6,476*	--
Wildlife Habitat Conservation Areas	42	1 %
Geologic Hazard Areas	231	4 %
Critical Aquifer Recharge Areas	1,547	24 %
Frequently Flooded Areas (FEMA Flood Zones)	4,921	76 %
Wetlands	194	3 %

2.4.6 Existing Issues and Strategies

2.4.6.1 Water Quality

Some streams and waterbodies within the watershed have had water quality violations that place them on the federal Clean Water Act 303(d) list of polluted waters for high levels of nutrients, high water temperatures, high levels of fecal coliform bacteria, high pH, and low levels of dissolved oxygen (DO).[23] As of the 2012 listing, there are 6 listings of waterbodies that are a category 5, requiring a TMDL or other Water Quality Improvement (WQI) project. These waterbodies include Burns Creek for pH, bacteria, temperature and DO, Pierre Creek for pH, Perry Creek for DO, Schneider Creek for dissolved oxygen, Summit Lake for polychlorinated biphenyls (PCB), and Totten Inlet for Bacteria. Burns Creek,

[23] For more information on the Department of Ecology's State of Washington, *"Water Quality Assessment and 303(d) list,"* (2012) visit http://www.ecy.wa.gov/programs/wq/303d/index.html.

Perry Creek, Pierre Creek and Schneider Creek are all listed as category 4A for bacteria, categorizing them as a polluted water that already has an approved TMDL in place and being implemented.

The quality of many streams, lakes, and nearshore waterbodies within the Kennedy-Goldsborough watershed have been degraded. Water temperatures have risen in response to a decreased groundwater inflow to streams and reduction of shade in riparian corridors (Plateau Technical Communication Services, 2006). One other water quality concern is excessive sediment in streams originating from runoff or erosion, affecting salmonid habitat. Loss of marine riparian habitat alters erosion rates, water quality, and the abundance of woody debris (Thurston County, 2013).

Areas most important for maintaining water quality within the watershed include streams, wetlands (particularly depressional wetlands), floodplains, and areas of high and low permeability. Depressional wetlands filter water and adsorb pathogens, phosphorus, and toxins. Depressional wetlands also provide nitrification and pathogen sedimentation. Floodplains are an additional area important to the sedimentation of pathogens (Thurston County, 2013). Areas of wetlands include patches along Highway 101 and Highway 8, along Oyster Bay Road Northwest and Steamboat Island Road Northwest, between Steamboat Island Road Northwest and Young Road Northwest just north of Frye Cove Park, and continued patches throughout the center of the peninsula through Indigo Farms.

Water quality impairments can occur from failing septic systems, agricultural operations, loss of wetlands, and clearing and new impervious surfaces. The densest development is at the tip of Steamboat Island Peninsula along Madrona Beach, surrounding Summit Lake, and along the major roads (Highway 8, Highway 101, and Steamboat Island Road). Parcels with assumed on-site septic are prevalent along the upper reach of Kennedy Creek, along Schneider Creek and Perry Creek, around Summit Lake, and throughout Steamboat Island Peninsula (Thurston County, 2013).

Current monitoring is done by Ecology, the Squaxin Island Tribe, Thurston County, and others. Monitoring is a component of efforts to set Total Maximum Daily Loads (TMDLs) for streams and nearshore areas that fail to meet 303(d) standards. Other monitoring efforts include Washington Department of Health's Shellfish Programs to ensure that commercial shellfish growing areas meet federal marine water-quality standards (Plateau Technical Communication Services, 2006). Harvesting shellfish between Steamboat Island and Hunter Point is prohibited due to contaminants (Thurston County, 2013).

2.4.6.1.1 Recommendations for Water Quality Issues

Recommendations from the Kennedy-Goldsborough Management Plan to improve water quality include the development of a comprehensive water-resource monitoring program including prioritizing sub-basins, schedules monitoring, identifying lead agencies and potential funding sources (Plateau Technical Communication Services, 2006).

The South Puget Sound Dissolved Oxygen Study (2014) covers areas in the south and central Puget Sound that are on the Clean Water Act section 303(d) list due dissolved oxygen levels that do not meet water quality standards. The study identifies how much human contributions are contributing to low DO concentrations in the south Puget Sound. This study focuses on several areas, including Totten and Eld

Inlets within the Kennedy-Goldsborough watershed. The DO standard violation at Eld Inlet was the highest in magnitude at 0.38 mg/L below the standard (Ahmed *et al*, 2014). This report recommends additional scenarios to isolate different sources of anthropogenic contributors to dissolved oxygen, including a combination of dye tracer simulations using just the circulation model as well as water quality runs that isolate marine point sources in the south Puget Sound (Ahmed *et al*, 2014).

2.4.6.2 Water Quantity

Water movement via overland flow may be impaired by impervious surface cover within the watershed. Overall, the portion of Kennedy-Goldsborough watershed that is within Thurston County has low levels of impervious surface, and therefore probably low levels of altered overland flow (Thurston County, 2013). Impervious surfaces and non-forested vegetation on low permeability soils also affect shallow sub-surface flows.

Most of this watersheds water comes from wells owned by municipal providers, community systems, and individuals. It is estimated that WRIA 14 receives approximately 1,360,000 acre-feet per year of water through rainfall. Most of the precipitation (ranging from 40 to 80 inches annual for the watershed) arrives in the winter months when water demands are the lowest (Ecology, 2012). About 930,000 acre-feet per year (or 68%) leaves the watershed through natural processes, such as creek flow or evapotranspiration, not including the water that flows underground and into the Puget Sound (Plateau Technical Communication Services, 2006). According to analysis, only 6,600 AF/yr is used within the watershed, leaving a surplus of 420,000 AF/yr for WRIA 14. However, quantities vary significantly between areas in the watershed and are impacted by stream flows and hydraulic continuity. Streams are most vulnerable and under the highest pressure during the summer and early fall when precipitation is at its lowest coupled with a high demand of water.

Water rights have been allocated for over ten times the amount of water used – 68,800 AF/yr. The majority of this water (60%) is for commercial-industrial uses, with most allotted in the Goldsborough sub-basin. Residential uses comprise about 25% of the water rights allocations, not including exempt wells that allow certain users small quantities of groundwater (i.e., single-family residences). Instream flows and tribal water rights also affect water quantity within the watershed.

Table 18. Water uses in WRIA 14

Use	Surface Water		Groundwater		Both	
	AF	**%**	**AF**	**%**	**AF**	**%**
Municipal	504	1.7	4034	11.0	4538	7.0
Irrigation	5328	17.7	5363	13.7	10691	15.5
Domestic	579	1.9	9697	24.8	10276	14.9
Commercial-Industrial	22236	74.0	19415	49.7	41651	60.3
Other	1417	4.7	271	0.7	1688	2.4
Total	30064	100.0	38780	100.0	68844	100.0

Table from the "WRIA 14 Watershed Management Plan Kennedy-Goldsborough Watershed", at http://www.ecy.wa.gov/programs/eap/wrias/planning/docs/WRIA14_Plan_FinalDraft.pdf

Instream flows are established under WAC 173-514 to retain perennial rivers, streams, and lakes within the Kennedy-Goldsborough water resource inventory area necessary to protect wildlife, fish, scenic, aesthetic, environmental values, recreation, navigation and water quality. Future water rights to divert or store public surface waters within WRIA 14 shall not conflict with the WAC. This rule partially closes numerous streams and adopts instream flows on other streams and creeks. No water in the watershed is set aside in a reserve for future uses. Applicants that seek new water appropriations will likely need to provide mitigation for their impacts on water availability (Ecology, 2012). Some areas, such as Totten Inlet, may be at risk for seawater intrusion (Ecology, 2012).

2.4.6.3 Fish and Wildlife Habitat

The Kennedy-Goldsborough watershed supports two species of salmonids – Chum and Coho – as well as winter steelhead and coastal cutthroat (Plateau Technical Communication Services, 2006). These species also use nearshore areas, along with Chinook salmon. The major habitat limiting factors are described in the Salmonid Habitat Limiting Factors for WRIA 14 (Kuttel, 2002). The categories of habitat limiting factors include fish passage, riparian buffers, streambank condition, floodplain connectivity, width/depth ratio, substrate embeddedness, large woody debris, pool frequency, pool quality, off-channel habitat, water quality, water quantity/dewatering, flow regime, biological processes, and estuary/nearshore conditions. Some of these categories overlap with each other and one habitat problem could impact more than one habitat limiting factor category.

Habitat parameters are considered limiting if they are rated "poor". Fish passage was poor for Perry Creek, and fair to poor for Eld Inlet and tributaries and Kennedy Creek. Riparian Canopy closure was rated poor for Schneider Creek, County Line Creek, and Kennedy Creek, and good to poor for Perry Creek. Streambank condition was rated poor for Kennedy Creek and fair to poor for Perry Creek. Floodplain Connectivity was rated poor for Perry Creek. Substrate embedment was rated poor for Eld Inlet and tributaries and Schneider Creek, and fair to poor for Kennedy Creek. Large Woody Debris was rated poor for County Line Creek and Snodgrass Creek, and good to poor for Perry Creek and Schneider Creek. Large Woody Debris key pieces was rated poor for Perry Creek, Schneider Creek, County Line Creek, and Snodgrass Creek, and fair to poor for Kennedy Creek. Pool frequency was rated poor for Snodgrass Creek, fair to poor for Perry Creek and Schneider Creek, and good to poor for Kennedy Creek. Pool Quality was rated good to poor for Perry creek and Kenney Creek. Data gaps exist for off-channel habitat, water quality (temperature and DO), water quantity, and for Eld Inlet and Snodgrass Creek for flow regime and biological processes.

According to the WDFW local habitat assessment, WRIA 14 contains some of the best condition habitat in Thurston County, located in the Black Hills south of Highway 101. The Steamboat Island Peninsula is a mosaic of habitat conditions ranging from medium to low quality, with the areas of lowest quality concentrated along Mud Bay, Madrona Beach, Highway 101, Highway 8, and at the western tip of the

peninsula. Four contaminated terrestrial sites are mapped within WRIA 14 and are located near the headwaters of Perry Creek close to Highway 8, west of Highway 101 near Madrona Beach, south of Gallagher Cove, and at the tip of the Steamboat Island Peninsula (Thurston County, 2013).

The primary focus for terrestrial and upland wildlife habitats is on prairie species of concern, including the Taylor's checkerspot butterfly, the Streaked horned lark, the Mazama pocket gopher, and the Oregon spotted frog. Clam and geoduck areas occur along the western and northern shoreline of steamboat island peninsula, Edgewater beach, and along Madrona Beach southward. At the time of report development, there are no Mazama Pocket Gopher soils in the Kennedy-Goldsborough watershed. The decline of prairie species of concern is largely contributed to habitat loss, encroachment by trees, nonnative grasses, and invasive species such as Scot's broom.

2.4.6.3.1 Recommendation for Fish and Wildlife Habitat

Several recommendations are made in the Salmonid Habitat Limiting Factors for WRIA 14 report to improve habitat functions (Kuttel, 2002). These recommendations address potential anthropogenic causes of habitat degradation, including dams, grazing, residential development, lack of large woody debris, low summer stream flows, lack of riparian vegetation, and other causes. Some of the recommendations for habitat limiting factors of salmonids include: install fish passage structures, fence livestock out of riparian zones, replant native riparian vegetation, preserve large coniferous trees in riparian zones, increase summer instream flows, and maintain natural wetland function (Kuttel, 2002).

2.4.6.4 Flood Hazards

Areas within the 100-year floodplain are important for surface water storage. The 100-year floodplain mapped in the Kennedy-Goldsborough watershed in Thurston County includes: a small area at the west end of Summit Lake; all of the marine shorelines; the Upper Kennedy Creek and a portion of mid-Kennedy Creek that connects to the western side of Summit Lake. Disruptions of floodplain connectivity have occurred on some streams in the watershed, but in general floodplain connectivity is characterized as good to fair (Kuttel, 2002).

In 1923, Goldsborough Creek produced a sizable flood that inundated Shelton from Seventh Street downstream to Oakland Bay. The creek produced major floods again in 1932 and 1935, resulting in a thorough cleaning and armoring to protect the city. Woody debris removal was common in the watershed to improve streamflow and reduce risk of flood until its importance to fish habitat was realized (Kuttel, 2002). Maintenance of riparian buffers and vegetation helps to reduce flood damage and slow flood waters, but requires a stable streambank in order to recover after a flood disturbance.

2.4.6.4.1 Future Concerns for Flood Hazards – Climate Change

Climate change is expected to increase the Pacific Northwest's average temperature by 4.3 °F, causing the hydrologic cycle to change. Summer precipitation is expected to decrease, with autumn, winter and spring precipitation likely to increase (TRPC, 2016). An increase in winter precipitation may increase the likelihood of flooding. Sections of Highway 101 may also be vulnerable to flooding in the future when

combined with the effects of sea-level rise. Agriculture is expected to be relatively resilient to the impacts of climate change (TRPC, 2016).

2.4.6.5 Loss of Farmland

The Community Farmland Trust (2009) suggests that a majority of Thurston County's farmland is at risk of being converted to other uses, indicated by nearly 75% of farmland within 3 miles of an Urban Growth Area, only 51% of farmland enrolled in the Open Space tax program, the majority of farmland lying outside of a Long Term Agricultural zone, an average age of 57 years old for principal farm operators, and a majority of rented land among farms. The Kennedy-Goldsborough watershed does not have any Urban Growth Areas within it, but is under 1.5 miles from the border of the Olympia Urban Growth Area. There is one small tract of agricultural activity at this closest border, along Madrona Beach and Highway 101 before separating to Highway 8. A total impervious area estimate at buildout by basin is estimated as 2 to 10% for Eld Inlet, Perry creek, Schneider Creek, Totten Inlet, and Burns / Perry Creek. The Squaxin Passage basin is estimated at 10 to 25% impervious surface at buildout (TRPC, 2015).

Current efforts and existing strategies to protect farmland in this watershed include Long Term Agriculture zoning. Currently from the 2015 Thurston County zoning layer, no Long Term Agriculture occurs in the Kennedy-Goldsborough watershed. Additionally, Purchase of Development Rights (PDR) and Transfer of Development Rights (TDR) programs exist for Thurston County in an effort to preserve farmland, though continued funding has been a challenge. Other measures within the county to protect farmland include agricultural and conservation easements, rural resource cluster development, and open space taxation programs for current use farm and agricultural classification. Five land trusts hold easements in Thurston County, including the Capitol Land Trust, Nisqually Land Trust, Northwest Rangeland Trust, PCC Farmland Trust, and South of the Sound Community Farm Land Trust (TRPC, n.d.). The Capitol Land Trust in partnership with the Griffin Neighborhood Association form the Steamboat Conservation Partnership in 2009, which has collaborated to help conserve nearly 300 acres of natural area in the Steamboat peninsula region. In total, the Capitol Land Trust and partners have conserved more than 1,050 acres across 14 sites around Eld and Totten Inlets, some natural and some agricultural. Agricultural properties include the 530-acre Wynne Tree Farm that protects most of the upper Schneider Creek Valley, the 30-acre Appleby Conservation Easement that contains 15 acres of hay producing agricultural lands, 203 acres of the Triple Creek Farm Conservation, and 54 acres of the Willits Tree Farm.

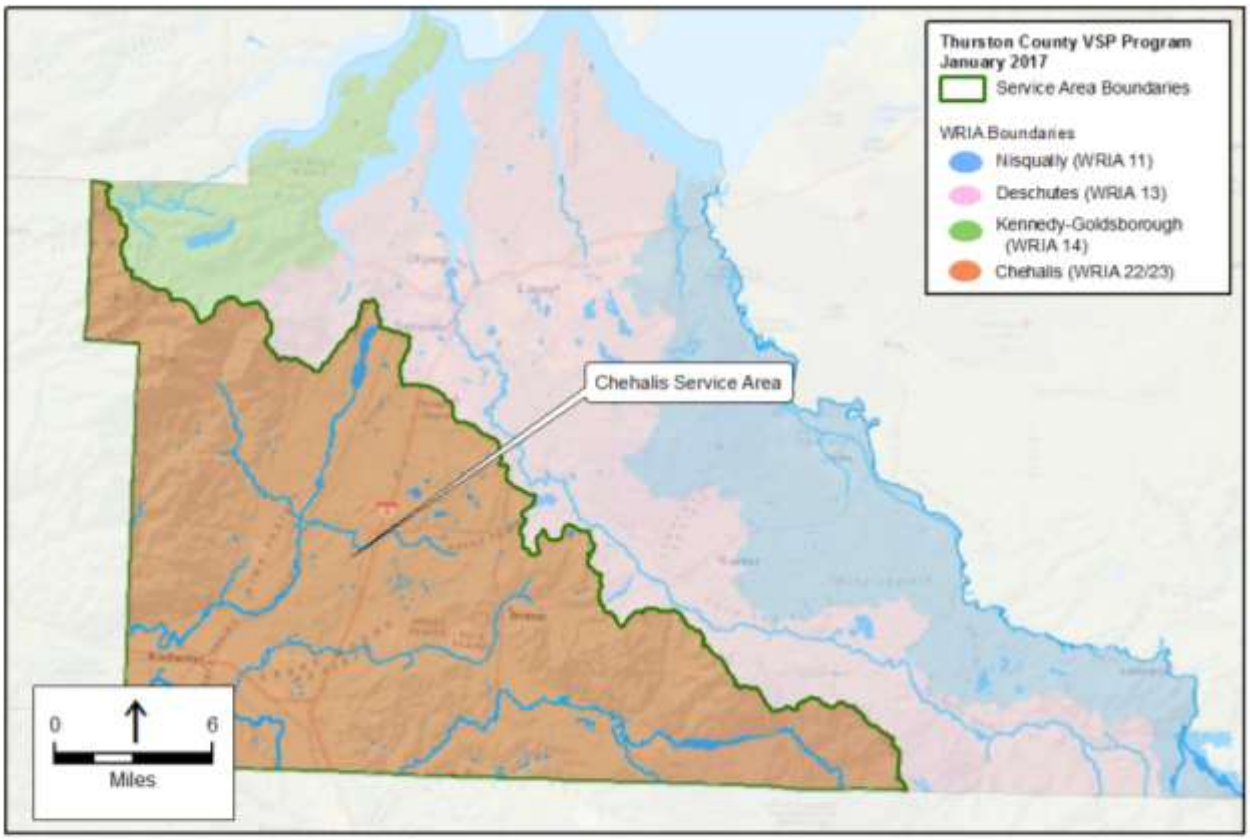
3 Chehalis Watershed Existing Information and Baseline Conditions

The effective date of the VSP legislation is July 22, 2011. This is the statutory date for identifying the applicable baseline for county requirements related to protecting a particular critical area, and for maintaining and enhancing agricultural viability. This baseline also delineates the assessment line between critical area protection and voluntary enhancement that may be promoted where needed,

through incentive-based measures, to improve critical area functions and values above the July 22, 2011 protection baseline. (RCW 36.70A.703)

The Chehalis Watershed is one of the county's major areas for agricultural activities.

Figure 1: Outline of the Chehalis Watershed in Thurston County



3.1 Watershed Management Plans and Existing Information

The Chehalis Basin Partnership (CBP) released a watershed management plan in 2004 as part of the voluntary watershed planning process called for by the Watershed Planning Act (ESHB 2514) that was passed in 1998 by the Washington State Legislature. This watershed planning was intended to allow for local input and collaborative planning with the goal of supporting economic growth and providing equitable and effective water resource management to sustain viable and healthy communities. These plans are required to address water quantity by assessing water supply and use within the watershed. They may also include the optional elements of water quality, in-stream flow, and habitat. The Chehalis

Watershed Management Plan includes all four aspects. The CBP invited stakeholders into the planning process and worked collaboratively over a five year period with local government agencies and interested groups and citizens to assess and manage the water resources of the basin. The Watershed Management Plan (WMP) was approved by the CBP on April 9, 2004. Goals and objectives in the plan focus on water quality, water quantity, in stream flow, and fish habitat. Based on the information gathered through the watershed planning process, as well as the group's goals, the Partnership developed recommendations for how to best manage water resources in the Chehalis Basin as well as a Detailed Implementation Plan (DIP).

The Chehalis Tribe has also developed plans that guide planning and investment decisions in southwest Thurston County. The *Comprehensive Plan and Zoning Ordinance* (2004) provides assurance that current and future land use activities on tribal lands are compatible, protect the Tribe's natural resources, and preserve the cultural interests and welfare of all members. The *Grand Mound 10-year Development Plan* (2009) developed by the Tribe at the request of Thurston County describes the Grand Mound community's vision, encourages cooperation, investment, public-private partnerships, and provides a foundation for planning and development.

The most recent effort to create a basin-wide strategy to address flooding and aquatic species in the Chehalis Basin began in 2011 with an analysis of flood damage reduction alternatives and the creation of the Governor's Chehalis Basin Work Group in 2012. The Governor's Chehalis Basin Work Group worked in partnership with state agencies, the Chehalis River Basin Flood Authority, and a consultation team to continue developing the long-term basin-wide strategy and foster a common understanding about potential flood-damage reduction alternatives and aquatic species restoration, using the best available science. Several workshops and public meetings engaged local and tribal communities, business, recreation, and environmental groups. The work group, partnering organizations, and stakeholders explored the potential for a water retention structure on the upper Chehalis and other actions to reduce flood damage, and developed the Aquatic Species Habitat Enhancement Plan (ASEP).

3.1.1 Recommendations and Suggested Actions

Chehalis Basin Watershed Management Plan

Water Quantity-Hydraulic Continuity

- Need to know how directly the water in the ground connects to the water in the Chehalis Basin's rivers and streams (how much groundwater wells affect stream flow levels)
    - Conducting a groundwater study in order to better evaluate whether an individual water right application would impact stream flows

Water Rights

- Develop and evaluate a "toolbox" of alternative approaches for those seeking water supply, water rights data and tracking, and enforcement. Actions include:

- Development of a regional water supply, or coordinated water system planning
- Improve enforcement of existing laws and regulations to support voluntary efforts
- Develop and implement water conservation programs

Exempt Wells

- Further evaluation of exempt wells to assess their cumulative impact on stream flows

Water Conservation

- In a general sense that water conservation be promoted, encouraged and supported (see table 4 on p. 23 of the watershed management plan for specific actions accepted by the CBP)

Water Quality

- A basin-wide water quality-monitoring program is needed (further evaluation for implementation)

Habitat

- Exploring a range of approaches to improve communication, coordination and consolidation of all habitat efforts in the Chehalis Basin. Specifically, restoration efforts need more basin wide coordination to be efficient and effective at preserving and restoring salmonid habitat
  - To assist in basin-wide coordination, the Watershed Planning Act (RCW 90.82) requires the integration of strategies developed under the Salmon Recovery Act (RCW 77.85).

Instream Flows

- Evaluate adequacy of minimum flows that were established by regulation in 1976 for 31 sites. Scientific information needs to be obtained to recommend specific flows for specific sites

Governor's Chehalis Basin Work Group Recommendations

The Governor's Work Group, in consultation with the state agencies and the Flood Authority, recommends an integrated package of flood-damage reduction and aquatic species restoration including:

- Initiation of the permitting process for a concrete flood retention structure on the upper Chehalis River, paired with improvements to the Chehalis-Centralia Municipal Airport Levee. This will include development of a project-specific mitigation plan to address impacts from a dam, with a recommendation about whether this structure should also include the ability for flow augmentation to be made in 2015.
- An unprecedented Basin-wide effort to restore aquatic species and reverse the decline of Spring Chinook, including restoration of over 100 miles of Spring Chinook spawning and rearing habitat,

repair of priority fish passage barriers, restoration of off-channel habitat for aquatic species, and a comprehensive strategy to address bank erosion. The restoration effort needs to start immediately (2015) and be completed within 15–20 years, and maintained adaptively over the long-term to ensure effective restoration for aquatic species in the Basin.

- Continued investment in the highest-priority, smaller-scale flood-damage reduction projects including raising homes, and flood-proofing businesses and public structures, with an emphasis on projects with multiple benefits.
- Local governments' land use management actions to protect remaining floodplain function, alongside flood-proofing to provide additional protection for residents and structures that are already located in harm's way.

The Work Group, with the support of state agencies, recommends a set of integrated investments over the next two years including: (a) initiation of a programmatic Environmental Impact Statement (EIS) to evaluate and further vet the timing and cost of the recommended package of flood-damage reduction and aquatic species restoration actions in preparation for permitting the individual components of the project, (b) further investment in laying the technical groundwork for successful implementation of water retention and aquatic species restoration efforts, and (c) further investment in near-term, on-the-ground projects such as smaller-scale flood damage reduction, floodplain management, flood-proofing, and flood warning and preparedness (Governor's Chehalis Basin Work Group, 2014).

3.1.2 Detailed Implementation Plan Strategies

The CBP began the process of addressing the goals and recommendations of the WMP through the development of the 2007-2008 DIP, which outlined a comprehensive approach for accomplishing the goals of the WMP through prioritized strategies and interim milestones. The Steering Technical Committee (STC) assigned by the CBP designed a three-step DIP development process. The first step was initiated by reviewing the 56 suggested actions from the recommendations in Section IV of the WMP. The STC identified 18 of these actions as distinct strategies for achieving the plan's five goals and related objectives. The STC also included other actions from the WMP under each of the strategies as prospective tasks as well as additional tasks for complete steps necessary for implementing the strategies. The STC then ranked each strategy and identified five of the eighteen strategies as being the most important to develop into detailed work plans for implementation. These five strategies and interim milestones for implementing the five WMP goals for water quantity and meeting minimum instream flows are summarized below (from Table 1 on p.7 of the WMP). Each interim milestone also has a complete work plan that includes: tasks, start date, strategy oversight responsibility, committed project participants, project resources needed, and state or local approvals needed.

- DIP Strategy 1: The Partnership recommends that the state make it clear to water rights applicants that there are flexible strategies for meeting their water rights needs given that hydraulic continuity is an issue

    - IM 1.1: Create a partnership with the Department of Ecology in issuing and transferring water rights
    - IM 1.2: Measuring to manage water quantity
- DIP Strategy 2: Recommend adequate funding levels for water resources management
    - IM 2.1: Develop a finance strategy work plan
    - IM 2.2: Implement an education and outreach work plan
    - IM 2.3: Build partnerships that leverage financial resources
    - IM 2.4: Develop a watershed management work plan that will develop prioritized, project lists that tie specific water quality, quantity, and habitat projects to funding opportunities
- DIP Strategy 3: Identify tools available to meet the Water Quantity Goals
    - IM 3.1: Clarifying water rights and uses
    - IM 3.2: Add a Water Quantity Committee
    - IM 3.3: Resolving issues related to exempt wells
    - IM 3.4: Developing tools for meeting water quantity needs
    - IM 3.5: Recommending instream flow levels
- DIP Strategy 4: Develop approaches to keep forestry and agriculture on the land
    - IM 4.1: Inventory and analysis
    - IM 4.2a: Promoting local agriculture and forestry – Education and Outreach
    - IM 4.2b: Promoting Local Agriculture and Forestry – Sustain, Promote, and Develop
    - IM 4.2c: Provide a Sustainable Business Climate
    - IM 4.2d: Innovative Approaches to Water Rights
- DIP Strategy 5: The Partnership recommends exploring a range of approaches to improve communication, coordination, and consolidation of all habitat efforts in the Chehalis Basin
    - IM 5.1: Foster communication and coordination among groups for habitat restoration and protection
    - IM 5.2a: Develop a habitat restoration and protection outreach effort
    - IM 5.2b: Develop a finance work plan for habitat restoration and protection
    - IM 5.2c: Assessment, implementation, and monitoring of habitat restoration and protection activities and plan

3.1.3 Status of Watershed Management Plans

The DIP was implemented in 2007 and the many accomplishments were compiled in the first progress report in 2011. This document inventories the progress made on actions within the WMP and DIP as well as the work completed by the CBP and its partners since the beginning of watershed planning in 1998. Since 1998 nearly $11.3 million has been spent on projects focused on water quality, water quantity, and habitat throughout the Chehalis Basin (Chehalis Basin Partnership, 2011). The progress report outlines these grants and projects in detail starting on page 6.

The CBP also released a second progress report in November 2012 that looks at the 4 priority areas the group identified from the DIP for focused efforts in 2012. The 4 areas are:

- DIP Strategy 4: Develop approaches to keep forestry and agriculture on the land.
    - Develop mechanism for sharing water that benefits all.
    - Promote sustainable agriculture.
- DIP Strategy 2, Interim Milestone 2.2 and 2.3: Implement an education and outreach work plan; Build partnerships that leverage financial resources.
    - Continue education/outreach
    - Continue to form partnerships to fund CBP daily operations and projects.
- DIP Strategy 1, Interim Milestone 1.2: Measuring to manage water quantity.
    - Find funding to continue the work of the groundwater/surface water model with the USGS.
- DIP Strategy 3, Interim Milestone 3.4: Developing tools for meeting water quantity needs.
    - Find funding to continue the feasibility work of an aquifer storage and recovery project.

This progress report outlined what had been accomplished towards each of these DIP Strategies since January 2012. These actions can be accredited towards the VSP goals as progress made since 2011:

- DIP Strategy 4: Develop approaches to keep forestry and agriculture on the land.
    - Develop mechanism for sharing water that benefits all.
        - Discussions with CBP, Dept. of Ecology, water rights professionals, and other interested parties.
        - Creation of a Water Banking Q&A document that describes what a water banking mechanism could and couldn't do for the Chehalis Basin.
        - City of Centralia's water rights reviewed by Pacific Groundwater Group, will be filing some water rights change applications, then could be used in a pilot water banking project after change applications are accepted/completed.
    - Promote sustainable agriculture.
        - The on-going discussion of water rights and water banking will eventually lead to promoting sustainable agriculture, basin-wide.
- DIP Strategy 2, Interim Milestone 2.2 and 2.3: Implement an education and outreach work plan; Build partnerships that leverage financial resources.
    - Continue education/outreach
        - Monthly Grays Harbor Stream Team meetings and events.
        - Attend Centralia Stream Team meetings quarterly.
        - Participating in community festivals and fairs.

        - Helping solicit and review articles for bi-monthly Drops of Water online publication.
        - Chehalis Basin Student Congress.
        - Held Annual/2012 Chehalis Watershed Festival.
        - McDonald Creek Restoration Project.
        - Monthly informational presentations to the CBP from organizations/jurisdictions around the Chehalis Basin.
    - Continue to form partnerships to fund CBP daily operations and projects.
        - Chehalis Tribe contributed $15,000 in 2012.
        - Thurston County contributed $15,000 in 2012 and in 2013.
        - City of Centralia contributed $15,000 in 2013.
        - Thurston PUD contributed $1,200 in 2012.
        - Port of Grays Harbor contributed $2,000 for meeting space for 2012 and 2013.
        - There is funding to cover staff (Watershed Coordinator) for CBP
        - Need to find funding to cover beyond December 2015.
- DIP Strategy 1, Interim Milestone 1.2: Measuring to manage water quantity.
    - Find funding to continue the work of the groundwater/surface water model with the USGS.
        - A project proposal was submitted to the Dept. of Ecology for project funding for the 2013-2015 biennium, to continue the data collection and analysis for the basin-wide groundwater/surface water study with the USGS
        - Andy Gendaszek from the USGS presented to the CBP in September 2012 on the next steps for continuing the groundwater/surface water study.
- DIP Strategy 3, Interim Milestone 3.4: Developing tools for meeting water quantity needs.
    - Find funding to continue the feasibility work of an aquifer storage and recovery project.
        - A project proposal was submitted to the Dept. of Ecology for project funding for the 2013-2015 biennium, to start a feasibility study of aquifer storage and recovery on the Newaukum River.
        - Andy Gendaszek from the USGS presented to the CBP in September 2012 on the next steps for starting this feasibility study.

3.2 Water Quality Data and Plans

The following information on water quality is primarily from the Department of Ecology's website and publications on the Chehalis Watershed area. The Chehalis River and many of its largest tributaries often do not meet water quality standards for temperature, dissolved oxygen, fecal coliform, pH, and nitrogen and phosphorus compounds. The watershed has been the subject of several water quality studies since

1990. The studies include 303(d) listings for dissolved oxygen (DO), fecal coliform bacteria (BacT), and temperature (T) conditions. [24]

Water Quality Standards

Washington State Department of Ecology sets water quality criteria to protect beneficial uses (also known as designated uses), including public water supply, protection for fish such as salmonid spawning, rearing, and migration habitat, protection for shellfish and wildlife, as well as recreational, agricultural, industrial, navigational, and aesthetic purposes.[25] The water quality criteria are applied along with the designated uses for every waterbody in the state. Table 19 and 20 provide water quality parameters and criteria for water bodies in the Chehalis Watershed.

Table 19: Water Quality Standards: Black River—beneficial uses include salmon spawning, rearing, migration habitat, and primary contact recreation.

Parameter	Condition	Value
Temperature	Highest 7- DADMAX.	17.5º C. Supplemental spawning criteria of 13°C applies from Feb 15 – Jul 1 for the lower part of Black River, Beaver Creek, and Mima Creek as well as most of Waddell Creek and Skookumchuck River above the reservoir.
Dissolved Oxygen	Lowest 1 day minimum.	8 mg/L.
Turbidity	Turbidity shall not exceed:	5 NTU over background when background is <= 50 NTU -or- 10% increase in turbidity when background is > 50 NTU.
Total Dissolved Gas	% Saturation.	Total dissolved gas shall not exceed 110% of saturation at any point of sample collection.
pH		Range within 6.5 – 8.5, with a human-caused variation within the above range of < 0.5 units.
Bacteria		Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies/100mL, with not more than 10% of all samples (or any single sample when less than 10 sample points exist) obtained for calculating the geometric mean value > 200 colonies/100 mL.

[24] Dept. of Ecology, "Water Quality Improvement Projects," *Chehalis River Area: Multi-parameter,* http://www.ecy.wa.gov/programs/wq/tmdl/ChehalisRvrTMDLSummary.html, (accessed Feb. 23, 2014).
[25] For more information visit the Department of Ecology's State of Washington website for *Surface Water Quality Standards* http://www.ecy.wa.gov/programs/wq/swqs/index.html or visit the *Water Quality Map Atlas* at http://www.ecy.wa.gov/programs/wq/303d/currentassessmt.html

Table 20. Water Quality Standards: Scatter Creek and Skookumchuck—beneficial uses include core summer salmonid habitat and primary contact recreation.

Parameter	Condition	Value
Temperature	Highest 7- DADMAX.	16º C. Supplemental spawning criteria of 13°C applies from Sep 15 – Jul 1 for Skookumchuck River from confluence with the Chehalis River to the reservoir.
Dissolved Oxygen	Lowest 1 day minimum.	9.5 mg/L.
Turbidity	Turbidity shall not exceed:	5 NTU over background when background is <= 50 NTU -or- 10% increase in turbidity when background is > 50 NTU.
Total Dissolved Gas	% Saturation.	Total dissolved gas shall not exceed 110% of saturation at any point of sample collection.
pH		Range within 6.5 – 8.5, with a human-caused variation within the above range of < 0.2 units.
Bacteria		Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies/100mL, with not more than 10% of all samples (or any single sample when less than 10 sample points exist) obtained for calculating the geometric mean value > 200 colonies/100 mL.

Water Quality Assessment and Impairments

The Federal Clean Water Act requires Washington State to prepare a list of all surface waters in the state that are impaired by pollutants. Washington's Water Quality Assessment (Sections 303(d) and 305(b) integrated report) identifies polluted waters that are documented in the online mapping tool.[26]

The Water Quality Assessment integrated report divides waterbodies into five categories based on the assessment of available and credible water quality data:

- Category 1—Meets tested standards for clean water
- Category 2—Waters of concern
- Category 3—Lack of sufficient data
- Category 4—Polluted waters that do not require a TMDL because the problems are being solved in one of three ways:
    - 4a—Has an approved TMDL and it is being implemented
    - 4b—Has a pollution control plan in place that should solve the problem
    - 4c—Is impaired by a non-pollutant such as low water flow, dams, and culverts

[26] For Washington's Water Quality Assessment and 303 (d) list visit: http://www.ecy.wa.gov/programs/wq/303d/index.html

- Category 5—Polluted waters that require a TMDL – the 303(d) list

There are temperature and DO problems throughout Thurston County, the following lists the polluted waters that require a TMDL (the 303(d) list) from the current (2012) EPA-approved assessment:

- Black Lake—Total Phosphorous
- Black Creek—Temp
- Carlisle Lake—Total Phosphorous, bacteria
- Chehalis River—Turbidity
- Elk Creek—DO
- Mill Creek—Temp
- Newaukum River, M.F.—DO
- Stillman Creek—Temp,
- Unnamed Creek (tributary to Scatter Creek)—Temp

Nutrients and Dissolved Oxygen

Ammonia (NH4+) is one measure of nitrogen that indicates non-natural nitrogen sources. Ammonia must be converted to nitrate before it is bioavailable to plants and algae. When higher-than-normal levels of nutrients are present, plants and algae can get out of control and lead to changes in the water's pH, dissolved oxygen and clarity. In addition, increased algae and plants can be ugly, create odor problems and low dissolved oxygen (DO) when they die, decompose, and interfere with recreational activities like boating and swimming.

Oxygen dissolved in healthy water is vital for the survival of fish and aquatic life. It is more difficult to transfer oxygen from water to blood than it is to transfer oxygen from air to blood. Therefore, it is critical that an adequate amount of oxygen is maintained in the water for this transfer to take place efficiently and sustain aquatic life. Dissolved oxygen is also necessary for aerobic decomposition of organic matter in the water and bottom sediments as well as for other biological and chemical processes.

Temperature

Water temperature influences what types of organisms can live in a water body. Cooler water can hold more dissolved oxygen that fish and other aquatic life need to breathe. Warmer water holds less dissolved oxygen. Threatened and endangered salmon need cold, clean water to survive.

One way to cool water temperature is to shade the water body by adding or retaining streamside vegetation. Groundwater is also important to provide cool temperatures in areas with groundwater discharge to streams and rivers.

Bacteria

Fecal coliform is a type of bacteria common in human and animal waste. It can make people sick and cause the closure of shellfish harvesting beds. Bacteria can get into our waters from untreated or partially treated discharges from wastewater treatment plants, from improperly functioning septic systems, and from storm water, livestock with direct access to streams and rivers, improperly managed manure, pets and wildlife.

3.2.1 Status of Water Quality Improvement Projects

Total Maximum Daily Load (TMDL) studies in the Upper Chehalis Watershed established allocations for bacteria, temperature, and Dissolved Oxygen. Nonpoint source approaches to meet stream temperature targets focus on effective stream shade as the most practical factor for influencing stream temperature improvements. There are two assumptions that the load allocations are based on: 1) the riparian vegetation will be protected and re-established as the result of management actions; and 2) water quality will be degraded no further by other influences. Implementation of projects that increase channel complexity and improve the natural hydrologic function of the Chehalis River and its significant tributaries will also improve stream temperature conditions. TMDLs also call for improvements that include reductions in stream widths and increases in channel complexity to improve hyporheic exchange (mixing of shallow ground water and surface water) and cold water refugia in reaches where those natural functions are impaired, which are important to both water quality and wildlife habitat.

The Upper Chehalis DO TMDL (2000) includes load and waste load allocations to reduce nonpoint and point sources of pollution that reduces DO below the water quality standards. The Black River, Scatter Creek, and Skookumchuck River sub-basins are included in that TMDL. The TMDL calls for implementation of BMPs that would eliminate or reduce nonpoint sources of BOD, ammonia, and total phosphorus including: livestock exclusion from rivers and streams along with no livestock waste discharges, land application of waste and fertilizers at agronomic rates, correction of OSS failures, storm water controls for residential and other developed areas to reduce total phosphorus loading to the maximum extent practicable.

The Upper Chehalis Bacteria TMDL (2004) established percent load reductions for nonpoint sources of fecal coliform bacteria on the multiple Black River, Scatter Creek, and the Skookumchuck River; the largest percent reductions were prescribed for Skookumchuck River (79%) and tributaries to Black River including Dempsey Creek (93%) and Beaver Creek (73%). Data collected after the TMDL was approved indicate that fecal coliform concentrations have reduced significantly from 1991-2009 in several areas, although temperature and dissolved oxygen violations continue to be problematic (Collyard, S. and M. Von Prause, 2010). Additional monitoring needs to occur on streams that have bacteria load allocations but were not measured during the 2006-2009 monitoring to determine if target limits for those waterbodies identified within the TMDL are being met. Continued implementation of BMPs and sustained management of existing BMPs are needed to maintain water quality standards.

Implementation Activities

Ecology's 2004 *Detailed Implementation Plan* (DIP) outlined strategies and watershed restoration activities needed to meet targets and pollutant load reductions described in the Chehalis River Watershed TMDL studies (Rountry, 2004). The DIP described pollution sources, responsible agencies, activities, and status of cleanup actions as well as secured and potential funding sources. For example, agriculture has a variety of responsible agencies from Conservation Districts (CDs) and NRCS to the Departments of Agriculture and Ecology. Actions that these agencies have implemented include, farm planning and technical assistance on BMPs, Environmental Quality Incentive Program, habitat and riparian enhancements, manure management, enforcement of the Dairy Nutrient Management Act and Concentrated Animal Operations rules, water quality monitoring, and the development of innovative technologies. Annual goals for cleanup of bacteria in the upper Chehalis Basin are based on a six-year schedule for achieving water quality standards.

The DIP recognizes that it will take longer than six years to attain standards for dissolved oxygen and temperature. The achievement of the temperature standards is largely dependent on the time it takes to grow trees that supply significant increases of riparian shade. The temperature TMDL estimated that it could take 60-plus years to grow trees that will provide enough effective shade for temperature standards to be achieved in the upper Chehalis Basin. Activities that have been implemented include the completion of farm plans, installation of riparian fencing and plantings, nutrient management activities, septic system management, land acquisition, and improvements to waste water treatment facilities. However, there are still areas with insufficient riparian shading and existing (and changing) land uses that will need BMP implementation.

Various organizations and individuals are helping to protect and enhance the riparian corridor to address the water quality and fishery resource concerns. The Recreation and Conservation Office (RCO) provides salmon recovery funding for projects vetted by the local Salmon Recovery Lead Entities that include removal of fish passage barriers and the acquisition/restoration of aquatic and riparian habitat. Landowners, the local conservation districts, the Confederated Tribes of the Chehalis Indian Reservation, counties, cities, volunteer groups including students, and local fishery support groups provide labor and plant materials for stabilizing the stream banks and to increase plant cover and shade. Increased shade is the most important best management practice (BMP) to lower temperatures in the river; but also important is protection and restoration of off-channel habitat, cold water refugia, and improvements to channel complexity for increased hyporheic exchange. The primary voluntary activities that landowners have been implementing include installing fencing to keep livestock from eroding the banks and planting more trees to increase shade.[27] The fence and vegetative "barriers" help prevent animals from defecating directly in or adjacent to a stream and filters bacteria from sheet erosion from pastures to keep it out of the river. Because these shoreline and riparian protections prevent or reduce transport of nutrient and BOD materials into the river, they help improve DO conditions as well.

[27] For more information on non-point pollution control success in the Chehalis River visit: http://water.epa.gov/polwaste/nps/success319/wa_chehalis.cfm

There are also unique cases that require further action for water quality protection such as the wide section of the river near the cities of Centralia and Chehalis, which is considered the critical segment for temperature and DO conditions. Very low stream gradient and long travel times were found to be a major cause of higher temperatures and lower dissolved oxygen in that segment known as the "Centralia reach". To prevent low dissolved oxygen problems in this reach during critical periods, the Chehalis wastewater treatment plant and the Darigold facility in Chehalis stop discharging to the river during low-flow river conditions and the treated effluent is instead utilized as reclaimed water and applied as irrigation on a poplar farm owned and operated by the city.

3.3 Farmland Protection Data and Plans

The Thurston County Comprehensive Plan (2004) addresses rural land use and resource lands, including agricultural, forestry, mining, and aquaculture.[28] Chapter 3 (Natural Resource Lands) of the Comprehensive Plan describes strategies for accomplishing the Growth Management Act (GMA) goal (as per RCW 36.70A.020) to "Maintain and enhance natural resource based industries, including productive timber, agricultural, and fisheries industries. Encourage the conservation of productive forest lands and productive agricultural lands, and discourage incompatible uses." The Comprehensive Plan recognizes the multiple benefits provided by farmland, including fish and wildlife habitat and flood control as well as the stewardship that farmers provide. The goal is to protect farmland and resource lands so that these types of activities can continue to exist and flourish in Thurston County. Strategies to protect agricultural areas include; zoning to reduce conversion to other uses, conservation easements and programs to encourage conservation of agricultural lands, transfer and purchase of development rights, current-use and open-space tax programs, and agritourism.

The Working Lands Strategic Plan presented specific strategies to conserve working lands and support the people who work them. The strategies were classified in four categories, which include: Working Lands Advocate, Economic Sustainability, Regulatory and Political, and Education and Outreach (see Section 1.3 for more information on farmland protection, strategies, and recommendations for Thurston County).

The priority strategies for enhancing economic development that were identified in the study done by the Pacific Mountain Workforce Development Council (PMWDC) included to: protect the viability and productivity of food production; develop a food safety/food security initiative; ensure balance in critical areas rules to protect producers; identify potential local opportunities and develop a stop-leakage strategy targeting our dependence on external supplies; help market local food; and provide policy advocacy and technical assistance for food suppliers.

[28] The Thurston County Comprehensive Plan (2004) was last amended by resolution 14845 on May 20, 2014. Available: http://www.co.thurston.wa.us/planning/comp_plan/comp_plan_home.htm

The Thurston Thrives program formed a collaborative strategy to address the challenges and opportunities related to local food systems within the Thurston region by forming a local food system panel from a broad representation of community leaders and others active in food production and distribution. This panel examined food system related issues and provided recommendations for meeting current and future food needs.

The American Farmland Trust study also provided recommended strategies for Thurston County and opportunities for improvement to better protect farmland, which included the rezoning of land surrounding LTA designation to Rural 20 and Rural 10 zones rather than RRR 1/5 in order to better buffer these areas from development pressures. They also recommended increasing the CFT rate to the maximum of 6.25-cents per $1000 dollars of assessed value, with the additional funding being allocated specifically to farmland purchase of development rights. As of 2012 Thurston County property tax payers paid 5.06-cents per $1,000 assessed value.

The primary recommendations for farmland protection from the AFT study were to:

- Include all viable farmland in agricultural zones (i.e. designated LTA)
- Improve the protections provided within agricultural zones (i.e. increasing minimum lot sizes and narrowing allowable uses)
- Purchase (or otherwise secure) development rights for critical farmland parcels
- Provide property tax relief (i.e. open space tax program) to all qualifying farmland
- Provide economic and regulatory assistance to farmers
- Have a position dedicated as liaison to the agricultural community

3.3.1 Status of Farmland Protection Programs

Thurston County's Long Term Agriculture (LTA) districts are mostly located in isolated pockets in the southern portions of the county, primarily in the Chehalis Watershed, and are surrounded by Rural Residential Resource (RRR) 1/5 zones (1 dwelling unit per 5 acres). Currently, 8,847 acres of agricultural lands are protected in LTA districts in the Chehalis Watershed. The LTA zoned agricultural lands also have some overlap with lands designated as Open Space Agriculture. Properties enrolled in the Open Space Tax Program are valued at their current land use rather than their "highest and best" use. Landowners who voluntarily commit to continuing agricultural uses may apply for current use classification, which results in significant property tax savings and helps reduce pressures to convert farmland. In the Chehalis Watershed 16,478 acres are designated as current-use Open Space Agriculture and 3,243 acres are designated as farm and agricultural conservation land. In 2011, there were 8,490 acres of land protection in Long Term Agriculture zones. Additionally, in 2011 there were 16,614 acres designated as current-use Open Space and 4,041 acres designated as Farm and Agricultural Conservation Land. In total, 23,732 acres of agricultural land were protected through zoning and/or open-space tax programs in the Chehalis Watershed in 2011. Since 2012, the Thurston Conservation District has continued to work with farmers to develop farm plans, nutrient management plans, and

Conservation Reserve Enhancement Program (CERP) Plans. In the Chehalis Watershed between 2012 and 2016, fourteen conservation plans were developed.

Several WWRP farmland preservation grants[29] were awarded in Thurston County in 2014, one specifically for conserving the Schweikert Farm along the Chehalis River. Protection of the 113-acre farm along the Chehalis River and Scatter Creek in South Thurston County will also conserve 27 acres of active floodplain reaches and protect habitat for coho and chum salmon as well as cutthroat trout. The property has a high level of productive habitat and ground water connectivity and is adjacent to 48 acres of land that is already conserved for salmon and wildlife habitat. Conserving more than a quarter-mile of the Chehalis River and a half-mile of Scatter Creek, this project will provide many long-term beneficial ecosystem functions as well as benefits to the community on what is planned to be a working educational farm.

3.4 Species Recovery Data and Plans

Terrestrial Habitat

The Upper Chehalis Watershed (WRIA 23) contains numerous large patches of good quality wildlife habitat. These areas are concentrated in the Black Hills (Capitol Forest area) along the Black River, in the eastern portion of WRIA 23 around Pitman Lake, around Skookumchuck Lake, and the upper reaches of the Skookumchuck River. The areas of lowest quality habitat are concentrated in Grand Mound, the Towns of Tenino and Bucoda, the Rochester area, the Interstate 5 corridor, Scott Lake, the Tumwater UGA, and Black Lake. WRIA 23 contains areas of numerous priority habitats and species. WRIA 23 contains many public preserves managed to conserve wildlife and habitat. These areas include: the USFWS Black River Unit of the Nisqually National Wildlife Refuge, Millersylvania State Park, Scatter Creek and Black River State Natural Areas, Mima Mounds State Natural Area, and Thurston County Glacial Heritage Preserve. In addition, although the Capitol State Forest is actively harvested for timber, it provides an expansive area free from residential development (Thurston County, 2013).

The habitats and species of concern in the Chehalis Basin are primarily prairie habitats and species that are either currently listed under the Endangered Species Act (ESA), are current candidates for listing, or are wildlife species and habitats of local importance. Thurston County is currently working with USFWS to develop the Habitat Conservation Plan (HCP) that will preserve prairie habitat and species. The HCP outlines a series of methods that can be used to regulate activities that could potentially harm a species listed under the ESA. These plans describe the threats and opportunities for each species and determine an acceptable level of impact that won't put the species or its habitat at risk.

[29] For more information visit the Recreation and Conservation Office WWR Program webpage

In order to protect all of the species in the region, Thurston County's HCP will cover the entire prairie ecosystem. It will not focus on specific species but rather the entire habitat where they might be found. This will not only protect the populations that are on the decline, but prevent the future extinction of species that haven't been listed yet. It is also important to develop site-specific methods and stewardship plans for early conservation, which creates more management options for landowners and for the species. Voluntary and early conservation methods also minimize the cost of species recovery and the potential for restrictive land use policies that may be necessary in the future. If the needs of the species are addressed before the laws come into effect, there will be more flexibility in ways to stabilize or restore species and their habitat.[30]

In-stream and Riparian Habitat

The Chehalis Basin Salmon and Steelhead Habitat Limiting Factors (Smith and Wenger, 2001) report describes salmon stocks in the basin and habitat factors that are limiting to salmon recovery. Although stock status and distribution data are limited, the Salmon and Steelhead Stock Inventory (SASSI) report (Washington Dept. of Fisheries, Washington Dept. of Wildlife, & Western Washington Indian Tribes, 1994) identified seven fall chinook stocks, one summer chinook stock, and one spring chinook stock. The spring chinook stock spawns in the upper Chehalis Watershed and is managed for wild production. Hatchery releases of fall chinook as well as non-native stocks have occurred in the Humptulips, Satsop, Wynoochee, and Chehalis areas. Two stocks of fall chum are also identified and listed as "wild" and "native" although there has been considerable hatchery influence for the Wishkah and Satsop chum populations. The status of the Chehalis chum is "healthy" but the distribution of chum has decreased over time (Smith & Wenger, 2001). The Chehalis basin also produces more Coho smolts than any other system along the Washington Coast and the SASSI report lists seven stocks of Coho salmon. These stocks are all considered composites of hatchery and wild fish, with significant hatchery influence. Two summer steelhead stocks are identified in the SASSI and, other than in the Humptulips, their origin in the Chehalis basin is uncertain because of hatchery influence. Eight stocks of winter steelhead trout are listed in the SASSI report and most are native.

Human activities have exerted a large constraint on salmonid habitat in the Chehalis Basin with the most impairment for spring-run Chinook and Coho salmon and the least impairment for fall-run Chinook salmon and winter-run steelhead. The basin currently provides the greatest habitat potential for Coho salmon and fall-run chinook, based on the quantity, quality, and distribution of habitat (The Aquatic Species Enhancement Plan Technical Committee, 2014).

There is limited data available for other aquatic fish species populations and habitats in the Chehalis Basin. Information is available on distributions and relative abundance of fish populations, including

[30] For more information and a complete list of *Species of Concern* visit: http://www.co.thurston.wa.us/planning/hcp/hcp-species.htm (accessed Jan. 2015).

Pacific lamprey, white sturgeon, eulachon, Olympic mudminnow, speckled dace, largescale sucker, sculpin, and largemouth and smallmouth bass, but no information on abundance trends or clear indications of major limiting factors (The Aquatic Species Enhancement Plan Technical Committee, 2014).

The Chehalis Basin boasts the highest species richness of amphibians in Washington State with headwater areas that are prime habitat for stream-breeding and terrestrial species, as well as a floodplain with extensive side-channels that provide habitat for seven different species of stillwater-breeding amphibians (*Aquatic Species Enhancement Plan*, p. 51). The Oregon spotted frog (*Rana pretiosa)*, which was listed as Threatened under the Endangered Species Act (ESA) as of August 28th 2014, is one of these important amphibian species present in the Chehalis Basin. Other important species that contribute to the pattern of high species richness include, the coastal tailed frog (*Ascaphus truei)*, Cope's giant salamander (*Dicamptodon copei)*, Van Dyke's salamander (*Plethodon vandykei*), and the increasingly rare western toad.

Recent focus on species recovery plans have been on the Oregon spotted frog (OSF), due to its recent (2014) ESA listing. Only a few historical records exist for the distribution of the OSF, primarily for the upper Black River system. However, because of the impacts to its required open warm-water marsh habitat from invasive species and non-native aquatic predators, it is likely that the species was historically more wide-spread when there was more suitable habitat available. Based on information to date, the extant populations of OSF in the Chehalis Basin are located along the mainstem of the Black River in the vicinity of Mima Creek, Thurston County (WDFW database). Due to the nature of the OSFs life cycle and that it lives year-round in aquatic habitat, the species is especially vulnerable to non-native aquatic predators. Another limiting factor for the OSF appears to be the size of habitat because all occupied sites are greater than 10 acres (The Aquatic Species Enhancement Plan Technical Committee, 2014). Information on habitat limiting factors and the current populations of non-fish species in the basin is lacking and most available data represent occurrence records rather than population level data.

Categories of Habitat Limiting Factors

The major habitat limiting factors that Smith and Wenger (2001) identified for salmonid species are categorized to organize the *Salmon and Steelhead Limiting Factors* report and provide a reasonable structure to assess habitat conditions within the basin. These categories overlap with each other and one habitat problem could impact more than one of the following habitat limiting factor categories.

Loss of Access to Spawning and Rearing Habitat

Artificial structures that restrict access to spawning habitat for adult salmonids or rearing habitat for juveniles includes culverts, tide gates, levees, and dams.

Floodplain Conditions

Impacts include direct loss of aquatic habitat from human activities in floodplains (such as filling), disconnection of main channels floodplains, and impeding the lateral movement of flood flows and the main channel. In a natural state this lateral movement and the floodplains provide storage for floodwaters, sediment, and large woody debris, and contain numerous sloughs, side channels, and other features that provide important habitat.

Streambed Sediment Conditions

A broad range of impacts are associated with changes in the inputs of fine and coarse sediment to stream channels. This category also assesses instream habitat characteristics that are related to sedimentation and sediment transport.

Riparian Conditions

Impacts to riparian areas include timber harvest, development, clearing for agriculture, and direct access of livestock to stream channels. This category addresses factors that limit the ability of native riparian vegetation to provide shade, nutrients, bank stability, and large woody debris (LWD).

Water Quality

This category addresses water quality factors that directly affect salmonid populations including, stream temperature, dissolved oxygen, and toxics as well as turbidity and in some cases fecal coliform problems.

Water Quantity

Changes in flow conditions can have a variety of effects on salmonid habitat. The availability of summer rearing habitat is decreased by low flows, while increased peak flows can scour or bury spawning habitat. This category addresses changes in flow conditions brought about by water withdrawals, the presence of roads and impervious surfaces, the operation of dams and diversions, alteration of floodplains and wetlands, and changes in vegetation age.

Estuarine and Nearshore Habitat

These areas provide important rearing habitat and opportunity for the transition between fresh and salt water. Impacts include loss of habitat complexity and loss of tidal connectivity from activities and artificial structures such as bulkheads, overwater structures, filling, dredging, and alteration of sediment process. This category includes water quality issues in these areas such as toxics, dissolved oxygen, and water temperatures.

Lake Habitat

Impacts that are unique to the important habitat that lakes can provide are included in this category. Impacts include the construction of docks and piers, increases in aquatic vegetation, the application of herbicides to control plant growth, and changes in lakeshore vegetation.

Biological Processes

There are a variety of impacts included in this category brought about by the introduction of exotic plants and animals, increased predation or competition, and loss of food-web function due to habitat changes as well as the loss of ocean-derived nutrients caused by the reduction in the amount of available salmon carcasses.

Assessment of Habitat Limiting Factors

The *Salmon and Steelhead Habitat Limiting Factors* report identified and rated current, known habitat conditions in the Chehalis basin. Smith and Wenger developed a set of standards to compare the significance of different factors and consistently evaluate habitat conditions (Table 38 p. 300). Habitat conditions are rated into three categories: “good”, “fair”, and “poor”. These ratings adopted by the Washington State Conservation Commission (WSCC) are not intended to be used as thresholds for regulatory purposes, but as a coarse screen to identify the most significant habitat limiting factors as well as provide a level of consistency to allow comparisons of habitat conditions across the state. The summaries of habitat conditions represent generalized conditions within that river or stream and there are likely some reaches that will be in better or worse condition that the rating suggests. In many cases, significant data gaps and insufficient knowledge about the conditions were found and are indicated in the Summary of Chehalis Basin Limiting Factors Results (Smith &Wenger, 2001, Table 40, p. 307). For example, the Chehalis mainstem is rated good for fish passage and poor for sediment (gravel quantity), water quality, and water quantity. It is also considered poor for instream LWD and riparian areas, although there are data gaps. Floodplain conditions are rated poor from mid to upper mainstem. It remains important to fill in these significant data gaps and increase the knowledge of current conditions in the Chehalis Watershed.

Recovery Plans

The Chehalis Basin Lead Entity Habitat Work Group released the *Chehalis Basin Salmon Habitat Restoration and Preservation Strategy for WRIA 22 and 23* in 2011. This strategy addresses the most pressing limiting factors identified within the Chehalis Watershed (Kliem, John M. & Holden, Deborah A., 2011). In general, the limiting factors identified in the strategy (2011, Table 2, p. 61) are consistent with Smith and Wenger’s report (2001). The *Aquatic Species Enhancement Plan* Technical Committee compared the limiting factors identified in both of these studies for each sub-basin unit (2014, Table 3.1, p. 59). In a few cases the strategy identified additional limiting factors that were not identified in Smith and Wenger. For example, the strategy identified migration barriers, floodplain habitat, and habitat diversity as additional limiting factors in the Scatter Creek sub-basin unit.

The *Chehalis Basin Salmon Habitat Restoration and Preservation Strategy* (2011) presents seven goals and guiding strategies. Salmon habitat restoration projects and activities must meet one or more of the following strategies for inclusion on the Lead Entity's Habitat Project List for Salmon Recovery Funding Board consideration.

1. **Attain a healthy and diverse population of wild salmonids**
   Efforts in this direction will primarily focus on restoration and preservation of priority stocks, which include those listed as "depressed" under SASSI, threatened or endangered under the Endangered Species Act, and extirpated historic runs. Filling data gaps remains a high priority for fulfilling this strategy.

2. **Restore, enhance, and protect the Grays Harbor Estuary**
   The condition of the estuary today is indicative of the rest of the Chehalis Basin – a mixture of good and fair. The loss of near shore habitat and degraded water quality are considered the greatest problems and one of the primary focuses for restoration.

3. **Restore and preserve properly functioning riparian areas**
   Past land use practices as well as urbanization have greatly degraded riparian zones and the lead entity recognizes the need to expand the number of projects that assist landowners in reducing the impacts of their livestock to riparian areas.

4. **Restore habitat access**
   Numerous barriers on public and private lands eliminate access by salmonids to potentially prime habitat, thus replacing these dysfunctional culverts is a high priority.

5. **Restore properly functioning hydrology**
   Past land use practices including, ditching, filling, and armoring of stream banks in particular have negatively impacted hydrology in many subbasins and resulted in extreme high flows in the winter and low flows in the summer. These abnormal flow conditions scour spawning grounds, restrict access to rearing habitat, and degrade water quality through sedimentation. Downstream flooding and excessive bank erosion also occurs with greater frequency and affect.

6. **Restore floodplain and stream channel function**
   Salmon habitat projects that restore floodplain functions in subbasins are a major priority. The long-term goal is to remove all unnecessary levees and fortified structures along rivers that block fish access to historic floodplains.

7. **Prioritize habitat projects and activities within subbasins that provide the highest benefit to priority stocks**

> Funding resources available are insufficient to cover the needs of all projects within subbasins this funding must be focused on habitat projects and activities that have the highest potential for yielding the greatest biological impact to priority stocks.

The Chehalis Basin Lead Entity Habitat Work Group analyzed conditions within each subbasin and prioritized the degree of impact created by each limiting factor on the fitness and survival of priority stocks. Each limiting factor was assigned to one of three tier concerns. Tier 1 Concerns represented the most pressing limiting factors impacting the viable salmonid population parameters of abundance, productivity, diversity, and spatial structure. Tiers 2 and 3 follow in the same vein, although decreasingly reduced in priority due to their lesser benefit to fish. The Lead Entity preference is that if community values support the general recovery actions then Tier 1 Concerns ordinarily would be first in line for implementation due to their potential impact in providing the greatest benefit to fish. Even though Tier 1 Concerns will scientifically render the greatest benefit to fish, community values may not always endorse them as a priority, in which case it may be possible only to implement Tier 2 and 3 general recovery actions (Kliem & Holden, 2011). The prioritized concerns with general causes and actions are displayed in a matrix format at the end of each subbasin profile starting on page 69 of the *Chehalis Basin Salmon Habitat Restoration and Preservation Strategy* (2011).

A process to support decisions for adapting salmon recovery plans that incorporates scenarios of climate change impacts on stream flow and temperature, local habitat factors limiting salmon recovery, the ability of restoration actions to ameliorate climate change effects, and the ability of restoration actions to increase habitat diversity and salmon population resilience was developed in a study by the UW Climate Impacts Group (2013). This study found that restoring stream flow regimes, floodplain connectivity, and re-aggrading incised channels are most likely to alleviate stream flow and temperature changes and increase population resilience and habitat diversity (Beechie, et al., 2013). The Chehalis Basin Flood Authority and the Chehalis Basin Lead Entity Habitat Work Group have included these results in their *Aquatic Species Enhancement Plan* (2014) and recognize that climate variability can result in changes in the ecosystem, which can alter the availability and quality of habitat, and is an important consideration for any long-term planning efforts and future habitat enhancement activities.

3.4.1 Status of Species Recovery Plans

The current conditions of important wildlife species and habitat discussed in the previous sections reflects the numerous efforts and projects that have focused on habitat restoration and preservation in the Chehalis Basin. The Salmon Recovery Funding Board, created by Washington State Legislature in 1999, provides grants to protect or restore salmon habitat and related activities. Through the Recreation and Conservation Office (RCO), the board administers two grant programs; the Estuary and Salmon Restoration Program (ESRP) and the Family Forest Fish Passage Program (FFFPP). Projects that receive funding through these grant programs include those that restore degraded habitat to increase overall habitat health and biological productivity through activities such as replacing barriers to fish migration, replanting stream banks, removing dikes and levees, installing logs and tree root wads to slow rivers and creating habitat, and projects that acquire pristine habitat to protect existing, high quality salmon

habitat. There are also combination projects that combine acquisition, restoration, or planning projects that may include community education and outreach.

The 2013-2015 Salmon Recovery Funding Board budget includes $4.1 million for operations and $259 million for capital projects. There are also other Salmon Recovery grant programs through the RCO, including the Aquatic Lands Enhancement Account (ALEA), Washington Wildlife and Recreation Program, Marine Shoreline Protection, and Salmon Recovery. In December, 2014 the Washington Salmon Recovery Funding Board announced that salmon recovery projects in Washington State were awarded 18 million in grants.

Thurston County was awarded $518,755 for salmon recovery projects, including conserving a rare wetland along the Black River, conserving the Schweikert Farm along the Chehalis River, designing the restoration of Harmony Farms' Shoreline, maintaining Allison Springs' estuary plantings, designing a restoration project in Pioneer Park, and placing log jams in McLane Creek (Washington State Recreation and Conservation Office, 2014).[31]

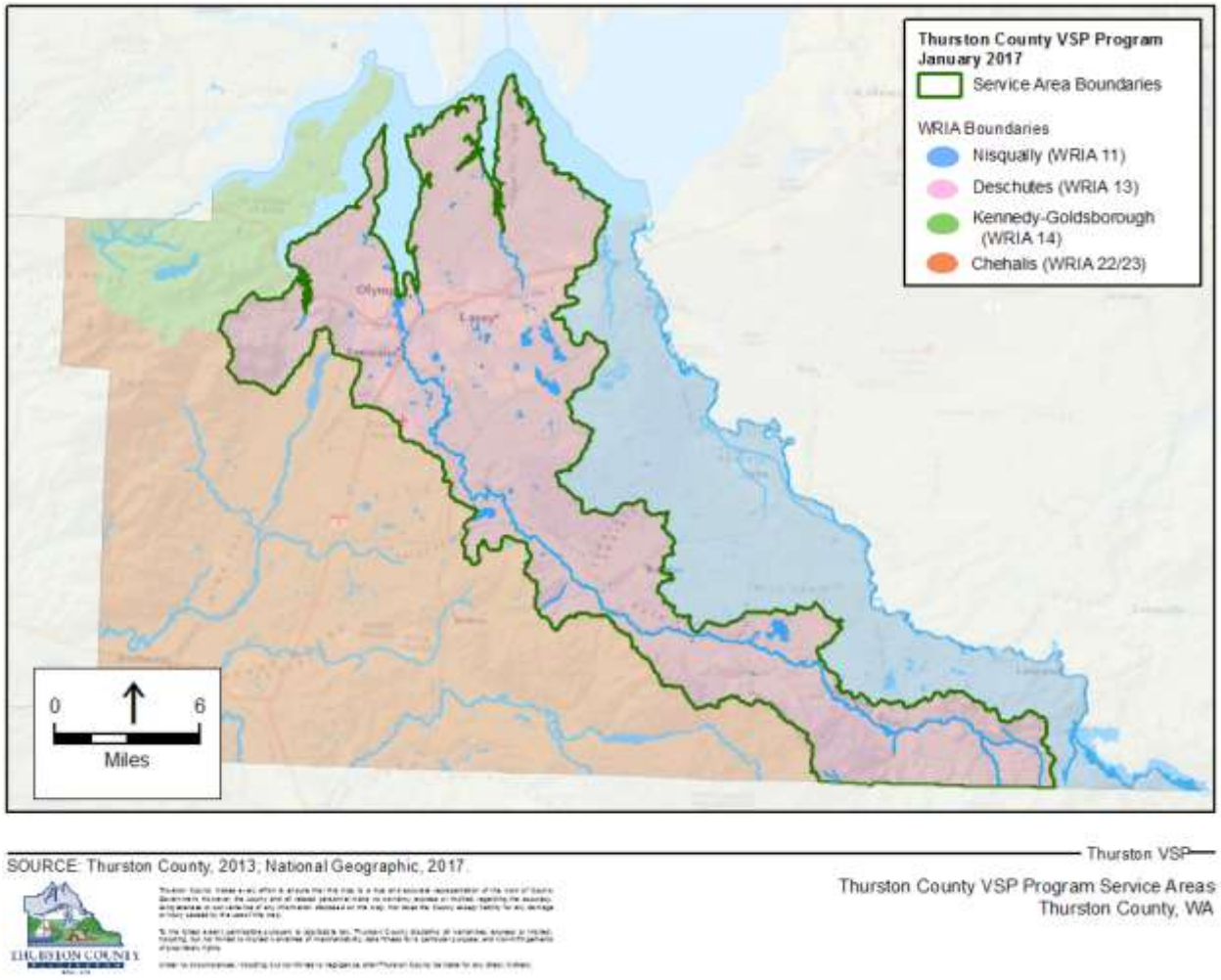
4 Deschutes Watershed Existing Information and Baseline Conditions

The Deschutes Watershed is a major area for agricultural activities, with nearly 15% of the watershed's acreage being mapped as an agricultural activity that intersects with one or more critical areas. This is a higher ratio than any of the other watersheds within Thurston County.

The effective date of the VSP legislation is July 22, 2011. This is the statutory date for identifying the applicable baseline for county requirements related to protecting a particular critical area, and for maintaining and enhancing agricultural viability. This baseline also delineates the assessment line between critical area protection and voluntary enhancement that may be promoted where needed, through incentive-based measures, to improve critical area functions and values above the July 22, 2011 protection baseline. (RCW 36.70A.703)

[31] RCO news release December 4, 2014: http://www.rco.wa.gov/doc_pages/press/2014/139.shtml

Figure 2: Outline of the Deschutes Watershed in Thurston County



4.1 Watershed Management Plans

The WRIA 13 Watershed Management Project brought together citizens, local governments, the Squaxin Island Tribe, and state and federal agencies in an attempt to develop a plan for allocating water, protecting water quality, and restoring fish habitat. The watershed planning effort was performed under the guidelines of state RCW 90.82, or the "Watershed Planning Act", with funding support from the Department of Ecology. The WRIA 13 Planning committee met from 1999 to 2004 to develop a plan, but fell one-vote short of a unanimous vote needed for the plan to proceed to the next level of adoption. As required by the Watershed Planning Process, the draft plan addresses water quantity, water quality, in-stream flow, and habitat. This plan makes recommendations that apply to all elements, water quantity, water quality, and habitat. In stream flow is addressed under the water quantity recommendations. Watershed planning for the Deschutes watershed stopped in phase 3, the planning phase and development of a watershed plan, due to inability to reach consensus. A Detailed Implementation Plan (DIP) was not drafted for the Deschutes Watershed.

The Basin Evaluation and Management Strategies for Thurston County (2013) was developed under the *Guiding Growth – Healthy Watersheds: Translating Science into Local Policy* project. This project identifies ways to accommodate for future population growth in the watersheds. This study presents a framework tailored to each watershed to develop better management policies and programs to maintain water quality and quantity in the watershed. This project builds the scientific base for strategies to better protect water resources in Thurston County, with many of the strategies implemented at the local level.

4.1.1 Recommendations and Suggested Actions

Deschutes Watershed Management Plan

The Deschutes Watershed Management Plan presents a plan for managing water resources within WRIA 13, a 270 square mile area within Thurston County. A key challenge in this watershed is balancing the water-needs of a growing region with the need to preserve adequate stream flows in rivers and streams.

Table 21. Draft WRIA 13 Watershed Plan Summary of Action Recommendations[32]

RECOMMENDATION	LEAD & PARTICIPANTS
RECOMMENDATIONS APPLYING TO ALL ELEMENTS (Ch. 2)	
WR1. Encourage strong support from the community and from local leader in achieving "water for fish and water for people"	
WR2. Be strategic in using limited resources to address water resource management needs now and in the future	
WR3. Provide stakeholder oversight of the Watershed Plan implementation	
WR4. Identify lead responsibility at the regional level for overseeing implementation of the WRIA plan	
WATER QUANTITY ELEMENT RECOMMENDATIONS (Ch. 3)	
CONSERVATION RECOMMENDATIONS	
C1. Design a regional conservation framework linking instream flow protection with water for our growing communities.	Expanding water systems, tribes, state agencies, major irrigators, UTC
C2. Maximize feasible use of Reclaimed Water given best science and current state laws.	
2a. Track and respond to emerging research on reclaimed water issues (ex. Endocrine disrupters).	LOTT Wastewater Alliance
2b. Create a conceptual map of the regional purple pipe trunk line.	Cities and LOTT
2c. Cities should define reclaimed water use "zones" including incentive programs.	Cities
2d. Request State financial support for purple pipeline systems.	Ecology/DOH and Legislature

[32] This table is from the Draft WRIA 13 Watershed Plan (Deschutes Watershed Planning Unit, 2004), pg. 1-8, available at http://www.co.thurston.wa.us/waterresources/basin/basin-wria13.html

2e. Excessively stringent State standards should be revised, such as the separation requirement for purple pipe from other pipelines.	Ecology/DOH
2f. Use of reclaimed water for water right mitigation or credit should be supported by Ecology and State Department of Health.	Ecology/DOH
C3. Request that DOH consider requiring new meters and reporting for all new public water systems serving seven or more residences.	Lead: DOH, Participant: Thurston County
C4. Ensure that Public Water System Conservation Plans are consistent with WRIA Watershed Plan objectives.	Lead: DOH. Participants: Water Systems, watershed committees, tribe, local governments.
C5. Design and implement a water supply management framework for independent irrigation and industrial water users within WRIA 13.	
5a. The Legislature should revise statutes to address "use it or lose it" problems, through balancing increased requirements for conservation with improved certainty for water rights.	Legislature
5b. Ensure compliance with conditions of water right and development permit approval for independent water suppliers.	Ecology Southwest Water Resources Program (SW WR), local governments
5c. Improve agricultural water use efficiency, especially within Long-Term Agriculture Areas.	Ecology, TCD, others
WATER RIGHTS MANAGEMENT RECOMMENDATIONS	
WR1. Seek funding through Ecology to complete mapping of all WRIA 13 rights and claims.	Ecology, Thurston County
WR2. Pursue removal of unused water rights and non-qualifying claim registrations from Ecology records in WRIA 13.	Ecology SW WR, potential "water master" task
WR3. Pursue effective oversight of water right statutes and permit conditions.	
3a. The County and local jurisdictions should encourage efforts of Ecology to obtain funding to enforce existing statutes and permit conditions relating to water rights	Ecology SW WR, potential "water master" task.
3b. Provide funding assistance where metering devices are required as a condition of water rights.	Ecology SW WR, potential "water master" task.
WR4. Manage "exempt" wells through consistent implementation of the WRIA 13 Instream Flow Rule.	Lead: Ecology SW WR. Participating: Thurston County
WR5. Support the "Nisqually Aquifer" Regional Water Supply recommendations in the WRIA 11 Watershed Plan	Led: WRIA 11 implementation group
WR6. Request that Ecology adopt Instream Flow Mitigation Guidance for water right applications, regulators and other interested parties.	Ecology
WR7. Revitalize the "Reservation of Public Water Supply for Thurston County" (WAC 173-591)	
7a. Update WAC 173-591	
7b. Use the Reservation to track water allocations.	Ecology SW WR
WR8. Explore the potential of innovative mechanisms such as a Water Master to implement WRIA 13 Plan water right recommendations.	Local interests and Ecology

WR9. Following initial WRIA Plan implementation, DOE and affected Tribes should evaluate the value and feasibility of a Water Right General Adjudication.	DOE, tribes, other parties
WR10. Support efforts of the Legislature and Ecology to improve the timeliness of the Adjudication Process.	Legislature, Ecology
EXISTING RIGHTS RECOMMENDATIONS	
ER1. Protect water rights associated with designated Long-Term Agriculture areas.	
1a. Preclude permanent transfers that would remove water rights from Long-Term Agriculture areas.	Ecology SW WR and Conservancy Board
1b. Protect water rights in Long-Term Agriculture areas from relinquishment.	Ecology, possibly Legislature
ER2. Utilize a water trust to preserve water for agricultural purposes.	Lead not yet defined
ER3. Request that Ecology remove the requirement for a formal water right change when shifting from one agricultural activity to another.	Ecology, possibly Legislature
ER4. Improve management of Urban Growth Area water rights.	
4a. When a proposed water right transfer would shift UGA rights to rural areas, Ecology and the WCB should retain sufficient rights with the original Place of Use to support the urban levels of development.	Ecology SW WR and Conservancy Board
4b. Expanding UGA water utilities should adopt policies to acquire existing water rights when extending water service.	Cities and expanding privately owners Public Water Systems
4c. Ecology should define clear, efficient administrative procedures to support consolidation of rights acquired by expanding urban water systems.	Ecology
4d. Drilling of new private wells within UGAs should only be allowed in locations that cannot be served by an existing water system.	Coordinated Water System Plan update: Thurston County lead, larger water utilities and DOH participants. Ordinance updates: cities.
4e. When public water is extended to a property with an existing individual wall, the well should be decommissioned to help protect aquifer water quality in these urbanizing areas.	City water systems: City ordinance revision Non-gov't systems: Implementation may require legislation or CWSP
INSTREAM FLOW RECOMMENDATIONS	
ISF1. Implement the "exemption" provisions of the WRIA 13 Instream Resource Protection Program WAC 173-513.	
1a. Develop regional aquifer monitoring objectives and an action plan.	Lead to be determined
1b. Identify funding to sustain region-wide groundwater data collection and analysis.	To be determined
1c. During development review, encourage installation of monitoring wells in locations identified by regional aquifer monitoring plans, WRIA Plans or to address a specific identified problem.	County and cities
1d. Encourage independent water suppliers to participate in the regional aquifer monitoring effort.	Privately owned community water systems and individual wells
1e. Seek funding to install permanent County-owned monitoring wells in the upper and lower Deschutes.	County lead

ISF2. Update Instream Resource Protection Program WAC 173-513 to remove outdated provisions and incorporate WRIA 13 Plan recommendations.	Ecology
ISF3. Develop a "water bank" to help address streamflow protection and restoration.	Lead not yet defined.
GROUNDWATER PROTECTION RECOMMENDATIONS	
GW1. Sustain long-term monitoring of aquifer levels and quality through the WRIA, to improve understanding of water resources, track trends and identify problems.	
1a. Develop regional aquifer monitoring objectives and an action plan.	Lead to be determined
1b. Identify funding to sustain region-wide groundwater data collection and analysis.	To be determined
1c. During development review, encourage installation of monitoring wells in locations identified by regional aquifer monitoring plans, WRIA Plans or to address a specific problem.	County and cities
1d. Encourage independent water suppliers to participate in the regional aquifer monitoring effort.	Privately owned community water systems and individual wells.
1e. Seek funding to install permanent County-owned monitoring wells in the upper and lower Deschutes.	County lead
GW2. Adopt land use protections for all approved Wellhead Protection Areas.	
WATER QUALITY ELEMENT RECOMMENDATIONS (Ch. 4)	
WRIA-WIDE WATER QUALITY RECOMMENDATIONS	
1. Jurisdictions should systematically implement and enforce existing regulations to protect water quality.	County and cities
2. Support implementation of the adopted and upcoming water quality action plans for WRIA 13 watersheds and water bodies.	Thurston County, cities, other entities identified in various plans
3. Design and implement an aggressive, innovative water quality outreach strategy for our region.	Local governments, tribes, non-governmental groups, shellfish industry
4. Pursue financial incentives and acquisition programs where needed to protect the most water quality-sensitive lands.	Lead to be determined.
5. Enhance city and county Stormwater programs to reduce impacts to water quality.	Cities and County
HENDERSON INLET AND NISQUALLY REACH SUB BASIN RECOMMENDATIONS	
Hend1. Support Shellfish Protection District (SPD) efforts to correct bacterial contamination of Henderson & Nisqually Reach shellfish growing areas.	Thurston County lead, SPD Stakeholder Group
Hend2. Support Ecology TMDL programs for Henderson Inlet and Nisqually Reach to address dissolved oxygen, temperature and other aquatic habitat impairments.	Ecology lead. County, cities, TCD participants.
Hend3. Investigate the implications of nitrate loading and other pollutants to shallow groundwater (Qvr) in urban areas such as Tanglewilde, and pursue remedial action.	
3a. Investigate the long-term implications of nitrate loading to the shallow aquifer in areas with urban-density development on septic systems.	County lead, City of Lacey, LOTT

3b. Develop clear city and County policies regarding conversion of urban area on-site systems to public sewer.	Cities and County.
3c. Pursue funding for needed remedial action.	Lead and sources not yet defined
Hend4. Supplement existing water quality monitoring to address emerging issues.	Thurston County, Lacey, Olympia, SPD Stakeholder Group
ELD INLET RECOMMENDATIONS	
Eld1. Prevent further degradation of the marine water quality in Eld Inlet by addressing all impairment-creating pollution sources.	
1a. Proceed with implementing the risk-based on-site system O&M program recommended in the adopted Cooper Point Wastewater Facilities Plan (1999).	Thurston County
Eld2. Protect McLane Creek aquatic habitat from water quality impairments through the DOE TMDL process and local Basin Planning.	
2a. Engage in the 2003-2005 TMDL process for McLane Creek Fecal Coliform	Ecology lead. County, cities, tribe, TCD participants
2b. A basin plan is needed to address the impact that changes in land use/land cover may have on stream flow.	Thurston County and Squaxin Island Tribe
BUDD/DESCHUTES RECOMMENDATIONS	
Budd1. Support Ecology TMDL process to correct aquatic habitat pollutant impairments in freshwater and marine waters.	Ecology lead. Local governments, tribes, LOTT, other participants.
HABITAT ELEMENT RECOMMENDATIONS (Ch. 4)	
Hab1. Identify and implement priority actions in the "Salmon Habitat Protection and Restoration Plan for WRIA 13" (July 2004) and other salmon habitat strategies for the South Sound region.	County, cities, other entities identified in habitat plans.
Hab2. Minimize habitat degradation from land use activities through enforcing local Critical Area, Shoreline and other habitat-oriented regulations.	
2a. Each local government should adopt an enforcement plan for environmental regulations and identify funding to implement the plan.	County and cities
2b. Provide funding for education and outreach	County and cities
Hab3. Initiate a long-term broad based program to provide permanent protection of sensitive habitat areas in WRIA 13 watersheds.	Squaxin Island Tribe, Capitol Land Trust, TCD, state and local governments, Friends of Deschutes, watershed landowners.
Hab4. Support the Deschutes estuary restoration feasibility study.	Capitol Lake Adaptive Management Plan Committee (CLAMP)
Hab5. Manage stormwater to reduce impacts to stream habitat.	County and cities
Hab6. Use watershed level assessments as input to land use management decisions that are necessary to protect critical areas.	
6a. Identify watersheds where significant disruptions in natural hydrology are predicted under full development under land use plans.	County and city stormwater programs

6b. Design land use management strategies to avoid and minimize these disruptions, such as shifting development out of sensitive watersheds and development standards.	County and cities.
Hab7. Fill important data gaps regarding streams and all significant species.	WDFW, local government, trained volunteers
7a. Provide comprehensive stream corridor and near-shore assessments where these have not been performed.	Tribal and state resource agencies, colleges (co-op student projects with agency biologist lead)
7b. Extend annual spawner surveys to all significant species.	WDFW, local government, trained volunteers

Basin Evaluation and Management Strategies for Thurston County – WRIAs 13 & 14

This report is a collaboration between Thurston County, the Thurston Regional Planning Council, cities of Lacey, Olympia, Tumwater, and Rainier, and the Squaxin Island Tribe. It focuses on identifying where conservation and restoration efforts will have the greatest impact in the watershed. Management goals are intended to accommodate projected growth, as required under the Growth Management Act, while still protecting basin and critical habitat ecological functions, water quality, and water flow conditions (Thurston County, 2013). Some of the management goals include to protect basin-wide conditions, restore basin-wide conditions, maintain existing basin-wide conditions, protect and restore critical habitats, minimize downstream pollutants from new growth, improve water quality and lower existing pollutant levels, minimize increase in peak flows, and improve water conditions where degraded. Management strategies and goals include (Thurston County, 2013):

Reduce the Impacts of Growth

Regulatory Tools

- Zoning regulations
- Critical Area regulations
- Stormwater Management regulations

Non-Regulatory Tools

- Fee simple acquisitions
- Purchase of conservation easements
- Restoration

Guide Growth Away from Sensitive and Impacted Basins

- Changes in zoning
- Purchase of Development Rights (PDR) and Transfer of Development Rights (TDR)
- Compensatory Mitigation (Thurston County Pilot Program)

Encourage Growth in Areas where Redevelopment is desired

- Leverage public money to attract private investment
- Encourage dense development
- Create incentives
- Use innovative financing tools
- Form partnerships
- Hire ombudsman to aggregate properties
- Pursue legislative agenda

4.1.2 Detailed Implementation Plan Strategies

The Deschutes Watershed Planning Unit completed a final draft of the watershed plan in October 2004, but was unable to reach consensus on the plan. Thus, watershed planning stopped in phase 3 for WRIA 13, the planning phase before adoption. A detailed implementation plan was not developed for WRIA 13.

4.1.3 Status of Watershed Management Plans

The final draft of the Deschutes watershed management plan was drafted in 2004, but was unable to move forward for adoption due to a lack of consensus. This draft is the most recent document of the watershed management plan for this watershed, as an implementation plan was never developed.

The information in the Basin Evaluation and Management Strategies report by Thurston County and the Thurston Regional Planning Council is to be reviewed by the Consulting Hydrologist and integrated with results of additional studies, including the Thurston County Watershed Characterization (to the maximum extent possible), to inform basin selection. This will be completed under the Scientific Advisory Team. After further stakeholder input, local policy makers will decide which basins will be studied further.

4.2 Water Quality Data and Plans

The following information on water quality is primarily from the Department of Ecology's website and publications on the Deschutes Watershed area.

Water Quality Standards

Washington State Department of Ecology sets water quality criteria to protect beneficial uses (also known as designated uses), including public water supply, protection for fish such as salmonid spawning and rearing, and migration habitat, protection for shellfish and wildlife, as well as recreational, agricultural, industrial, navigational, and aesthetic purposes. The water quality criteria is applied for

every waterbody in the state based on the designated uses for a waterbody. The following tables provide water quality parameters and criteria for water bodies in the Deschutes Watershed.

Table 22. Water Quality Standards: Deschutes River and tributaries, upstream of the tributary to Offut Lake—beneficial uses include core summer salmonid habitat and primary contact recreation.

Parameter	Condition	Value
Temperature	Highest 7- DADMAX.	16º C.
Dissolved Oxygen	Lowest 1 day minimum.	9.5 mg/L.
Turbidity	Turbidity shall not exceed:	5 NTU over background when background is <= 50 NTU -or- 10% increase in turbidity when background is > 50 NTU.
Total Dissolved Gas	% Saturation.	Total dissolved gas shall not exceed 110% of saturation at any point of sample collection.
pH		Range within 6.5 – 8.5, with a human-caused variation within the above range of < 0.2 units.
Bacteria		Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies/100mL, with not more than 10% of all samples (or any single sample when less than 10 sample points exist) obtained for calculating the geometric mean value > 200 colonies/100 mL.

Table 23. Water Quality Standards: Chambers Creek—beneficial uses include salmon spawning, rearing, migration habitat, and primary contact recreation.

Parameter	Condition	Value
Temperature	Highest 7- DADMAX.	17.5º C.
Dissolved Oxygen	Lowest 1 day minimum.	8 mg/L.
Turbidity	Turbidity shall not exceed:	5 NTU over background when background is <= 50 NTU -or- 10% increase in turbidity when background is > 50 NTU.
Total Dissolved Gas	% Saturation.	Total dissolved gas shall not exceed 110% of saturation at any point of sample collection.
pH		Range within 6.5 – 8.5, with a human-caused variation within the above range of < 0.5 units.
Bacteria		Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies/100mL, with not more than 10% of all samples (or any single sample when less than 10 sample points exist) obtained for calculating the geometric mean value > 200 colonies/100 mL.

Water Quality Assessment and Impairments

The Federal Clean Water Act requires Washington State to prepare a list of all surface waters in the state that are impaired by pollutants. Washington's Water Quality Assessment (sections 303(d) and 305(b) integrated report) identifies polluted waters that are documented in the online mapping tool. The Water Quality Assessment integrated report divides waterbodies into five categories based on the assessment of available and credible water quality data:

- Category 1 – Meets tested standards for clean water
- Category 2 – Waters of concern
- Category 3 – Lack of sufficient data
- Category 4 – Polluted waters that do not require a TMDL because the problems are being solved in one of three ways:
    - 4a – Has an approved TMDL and it is being implemented
    - 4b – Has a pollution control plan in place that should solve the problem
    - 4c – Is impaired by a non-pollutant such as low water flow, dams, and culverts
- Category 5 – Polluted waters that require a TMDL – the 303(d) list

There are numerous violations in the Deschutes Watershed for Dissolved Oxygen (DO), fecal coliform, temperature, pH, and fine sediment since 1998. The following lists the polluted waters that require a TMDL (the 303(d) list) from the current (2012) EPA-approved assessment:

- Huckleberry Creek – Temperature
- Indian Creek – Bacteria
- Moxlie Creek – Bacteria
- Budd Inlet – Dissolved Oxygen, bacteria
- Squaxin, Peale and Pickering Passaged – Dissolved Oxygen
- Ayer (Elwanger) Creek – pH, Dissolved Oxygen
- Deschutes River – Fine Sediment, temperature, Dissolved Oxygen
- Lake Lawrence Creek – Dissolved Oxygen
- Lawrence Lake – Total Phosphorus
- Long Lake – Total Phosphorus
- Pattison Lake – Total Phosphorus
- Henderson Inlet – Dissolved Oxygen
- Capitol Lake – Total Phosphorus, bacteria
- Woodland Creek – Temperature

- Sleepy Creek – Dissolved Oxygen, pH
- Percival Creek – Temperature, Dissolved Oxygen
- Nisqually Reach / Drayton Passage – Dissolved Oxygen, bacteria
- Mission Creek – Bacteria
- Adams Creek – Bacteria, pH
- Black Lake Ditch – Temperature, Dissolved Oxygen
- Ellis Creek – Bacteria
- Reichel Creek – Bacteria, Dissolved Oxygen, temperature
- Schneider Creek – Bacteria
- Spurgeon Creek – Bacteria
- Tempo Lake Outlet – Water

Nutrients and Dissolved Oxygen

The *Deschutes TMDL Water Quality Technical Report* (2012) identifies urbanization as a key potential contributor of excess nutrients. Urbanization and the water quality problems created by polluted stormwater affect the rivers, creeks, and lakes within the Deschutes TMDL Boundary. Polluted runoff can send nutrients, along with other harmful pollutants, into surface waters. Nutrients from non-natural sources can lead to excess plant and algal growth, which in turn reduces the available dissolved oxygen. Dissolved oxygen is essential for fish and aquatic life to survive.

Temperature

Water temperature influences the types of organisms that can live in a water body. Cooler water can hold more dissolved oxygen that fish and other aquatic life need to breathe. Warmer water holds less dissolved oxygen. Threatened and endangered salmon need cold, clean water to survive.

The Deschutes River often has an elevated summer water temperature. The draft Water Quality Report / Implementation Plan contains numeric loads for temperature (Wagner & Bilhimer, 2015). One effort to make progress on temperature problems is to establish forested riparian buffers (Levitt *et al.*, 2015).

Bacteria

Fecal coliform bacteria reductions are necessary in much of the study area. There are a variety of potential sources that contribute to bacteria levels, including wastewater discharges, cross-connected infrastructure, onsite-septic systems, domestic animals, recreational users, homeless populations, and non-point agricultural sources such as poor manure management (Wagner & Bilhimer, 2015).

4.2.1 Status of Water Quality Improvement Projects

The Total Maximum Daily Load (TMDL) studies in the Deschutes watershed contains numeric load allocations for temperature, bacteria, dissolved oxygen, pH, and fine sediment. The most important actions identified in the freshwater TMDL are to establish forested riparian buffers and conserve existing buffers along the Deschutes River and other streams (Levitt *et al.,* 2015). The recommendations in the TMDL focus on restoration of degraded functions, but don't consider in detail anticipated growth-related impacts.

Ecology implemented a phased approach to the Deschutes TMDL because the nature of dissolved oxygen impairments in the Budd Inlet is complex and affected by nutrients from the Puget Sound. The first phase uses the 2012 technical study to determine load allocations to meet water quality standards in the Deschutes River, Percival Creek, and Budd Inlet (Wagener & Bilhimer, 2015).

Nonpoint pollution source load allocations apply to all land uses within the TMDL boundary, including residential, commercial uses, agriculture, and forestry. Each land use category has potential effects on water quality and the report identifies best management practices (BMPs) to reduce or eliminate pollution from these land uses. The "Load Allocation" compliance area is the drainage areas that contribute non-point pollution to the location at which the water quality is being measured. When the appropriate BMPs for reducing pollution are used, those activities will be considered compliant with the TMDL (Wagner & Bilhimer, 2015).

Implementation Activities

The Implementation plan for the Deschutes TMDL is included in the Water Quality Improvement Report. In addition to setting load and waste load reductions needed to meet water quality standards, this report describes actions needed to achieve those reductions. One of the measures of success for the Deschutes TMDL is that the implementation plan is successfully implemented and there is ongoing adaptive management in the TMDL area so there is continuous identification and correction through technical assistance or enforcement (Wagner & Bilhimer, 2015). Essential actions identified in the Freshwater TMDL for the study area include (Wagner & Bilhimer, 2015):

- Low Impact Development (LID) should be instituted for future development in appropriate areas in the watershed, with particular attention to decreasing nutrient contributions below current levels. Future developments should not worsen DO or pH.
- Enhance channel complexity. Enhanced restoration should include LWD within the active river bed to promote bank stabilization and pool formation, and within riparian zones to provide self-armoring elements as banks are eroded.
- Reduce fecal coliform bacteria concentrations during the summer growing season.
- Maintain and enforce the current status of the Deschutes River watershed closed water withdrawal, eliminate illegal withdrawals, and quantify and mitigate the effect of exempt wells.

- Consider a water management strategy that recognizes the benefits of maintaining summer baseflows while meeting the community's need for water. This could be developed as a more details plan for restoring instream flows.
- Establish mature riparian shade throughout the entire Deschutes Watershed. Although the restoration of mature riparian vegetation and channel conditions would not create conditions where temperature meets the numeric criteria throughout the system, the actions would have significant results including cooling water temperatures, reducing the number of reaches above lethal temperatures, increasing minimum DO, and decreasing maximum pH (Roberts et al., 2012, Wagner and Bilhimer, 2015).
- The combination of restoration and improvement of riparian areas through the establishment of mature riparian shade, reduction of wetted stream widths and the near stream disturbance zone, and microclimate cooling would produce the biggest impact to raise minimum DO and lower maximum pH in the Deschutes mainstem.

Of the implementation actions listed to improve meet temperature, fecal coliform bacteria, dissolved oxygen, pH and fine sediment quality standards, the most critical is to establish forested stream-side vegetation corridors and conserve existing stream-side vegetation corridors on the Deschutes River and other streams. This is an implementation action that is required for improvement of temperature, fecal coliform bacteria, dissolved oxygen, pH, and fine sediment. This action will take a collaborative effort from land owners, non-profit organizations, and governments in the watershed.

When the appropriate BMPs for reducing pollution are used and limits and requirements for general permits are met, actions will be considered compliant with the TMDL (Wagner & Bilhimer, 2015). Some strategies have backstop methods in the event that the initial load allocations do not satisfy requirements. For example, in the case of fine sediment, a load allocation is presented as both an annual load as well as an estimated daily load to satisfy EPA requirements for commercial, non-federal forest lands. If the TMDL load allocation cannot be achieved through forest practice regulations (in addition to complete implementation on non-forest lands), then forest management practices will undergo an adaptive management process under the state's forest practices laws and regulations (Wagner & Bilhimer, 2015). The target for the Deschutes mainstem is to reduce fine sediments to no more than 12% substrate, which results in a 32% reduction in Weyerhauser, 30% reduction in Lake Lawrence, 41% reduction in SR 507, 40% reduction in Waldrick, and 46% reduction in Pioneer (Wagner & Bilhimer, 2015).

Many partners are needed to participate in implementation of the Deschutes TMDL, including government agencies, citizen groups, educators, and the Tribe, depending on their regulatory authority, influence, information, resources, or other involvement in activities to protect and restore the Deschutes River, Percival Creek, and Budd Inlet tributaries and watersheds. Implementation actions are broken down into: commercial forest landowner actions, construction stormwater general permittees, general land use category implementation actions, industrial stormwater general permittees, LOTT Clean Water Alliance, City of Olympia, Puget Sound Partnership, City of Rainier, Sand and Gravel General Permittees, Squaxin Island Tribe, Thurston Conservation District, Thurston County, City of Tumwater,

U.S. Environmental Protection Agency, U.S. Forest Service, Washington State Department of Agriculture, Washington State Department of Ecology, Washington Department of Enterprise Services, Washington State Department of Health, Washington State Department of Natural Resources, Washington State Department of Transportation, Washington State University (WSU) Stormwater Center, and Washington State University (WSU) Thurston County Extension Office.

Implementation actions will be tracked annually through meetings with the affected stakeholders beginning in 2016 (Wagner & Bilhimer, 2015). Tracking will help to identify and determine: what activities were performed and where they occurred; whether the actions work and can be applied elsewhere; what practices should be considered for adaptive management; whether there resource limitations or other factors preventing some actions from occurring whether this implementation plan is adequate to meet water quality standards; and if interim targets are met. Monitoring should continue after attaining water quality standards to ensure implementation measures are effective, remain in place, and the water bodies continue to meet the water quality standards. In the event that water quality data does not meet TMDL data and targets after activities have been implemented, implementation should be modified or new activities identified.

4.3 Farmland Protection Data and Plans

The Thurston County Comprehensive Plan (2004) addresses rural land use and resource lands, including agricultural, forestry, mining and aquaculture. The Natural Resources chapter (chapter 3) describes strategies for accomplishing the GMA goal of maintaining and enhancing natural resources (RCW 36.70A.020). An overriding philosophy of this chapter within the Plan is that in order to preserve agricultural land for future generations, the business of agriculture must remain economically viable. Agricultural lands of long-term commercial significance are required to be designated under the Growth Management Act. Criteria for designating such lands in Thurston County includes: soil type, availability of public facilities and services, land capability and tax status, relationship or proximity to UGAs, predominant parcel size, land use settlement patterns, proximity of markets, agricultural diversity, and environmental considerations.

The Working Lands Strategic Plan presented specific strategies to conserve working lands and those who work them. Strategies are classified into four categories, including: Working Lands Advocate, Economic Sustainability, Regulatory and Political, and Education and Outreach. County-wide planning policies support a role for Thurston County in an economic development function and provide appropriate context for strategies within the Working Lands Strategic Plan. These strategies are discussed in further detail in Section 1.

The American Farmland Trust study recommends strategies for Thurston County to better protect farmland, including zoning changes to areas surrounding LTA from Rural 1/5 to Rural 10 and/or Rural 20 and increasing the CFT rate to the maximum of 6.25-cents per $1000 dollars.

Farmland loss in the Deschutes is addressed as a concern in the Deschutes Scenario Development Report (Waters *et al.,* 2016). Farms that have implemented best management practices for protecting

water quality provide ecosystem benefits such as soil retention and water purification. Between 2000 and 2011, more than 700 acres of farmland were developed. More than 3,000 acres in the Deschutes watershed are vulnerable and at risk to conversion and development (Waters *et al.*, 2016).

4.3.1 Status of Farmland Protection Programs

Thurston County's Long Term Agriculture (LTA) districts are mostly located in isolated pockets in the central and southern portions of the watershed. These areas are generally surrounded by RRR 1/5 and Long Term Forestry. Currently there are 2,962 acres of Long Term Agriculture within the Deschutes Watershed in the 2016 Thurston County zoning layer (dated June 20, 2016). The 2011 zoning layer shows no change with 2,962 acres zoned as Long Term Agriculture (dated March 17, 2011). Properties enrolled in the Open Space Tax Program are valued at their current land use rather than their "highest and best" use. Landowners who voluntarily commit to continuing agricultural uses may apply for current use classification, which results in significant property tax savings and helps reduce pressures to convert farmland. Within the Deschutes watershed as of 2016, there are 8,442 acres designated as current use agriculture in the Assessor's Program. Additionally, 758 acres are designated as farm and agricultural conservation land in the Commissioner's program. In 2011 (from a parcel layer dated July 1, 2011), there were 9,254 acres enrolled in the Assessors current use as agriculture and 622 in the Commissioner's farm and agricultural conservation land. In total, 9,200 acres were protected in 2016 compared to 9,876 protected in 2011. This represents a 622 acre loss of land enrolled in the Open Space Tax Program. In this watershed, there is a drop in current use classification, but an increase in farm and agricultural conservation land. Since 2012, the Thurston Conservation District has continued to work with farmers to develop farm plans, nutrient management plans, and Conservation Reserve Enhancement Program (CERP) Plans. There have been 12 conservation plans developed in the Henderson basin between 2012 and 2016[33].

There has been 1 project receiving $750,000 in grant funding from the Recreation and Conservation Office towards a farmland preservation project within the Deschutes Watershed. This project is the Nelson Ranch easement acquisition, sponsored by Capitol Land Trust and expected to close in 2017. This project is to acquire an agricultural conservation easement on 550 acres of prime agricultural land, thereby ridding approximately 54 development rights. The farm also encompasses about 3.5 miles of the Deschutes River, the majority of the property lying within the Deschutes River floodplain and hosting native oak-prairie and over 56 acres of Mima Mounds and coniferous forest habitat. In addition to agricultural purposes, this property also supports Coho, steelhead, cutthroat trout, and potential habitat for the Mazama Pocket Gopher[34].

[33] Thurston Conservation District, *personal communication*, May 25, 2016
[34] For more information, with the Nelson Ranch Easement Acquisition project snapshot.

4.4 Species Recovery Data and Plans

Terrestrial Habitat

The Deschutes watershed (WRIA 13) is the most developed WRIA in Thurston County. The habitat within the cities of Olympia, Lacey, and Tumwater and their urban growth areas comprises the worst condition habitat in Thurston County. Other areas of poor habitat condition include the City of Rainier, surrounding Lake Lawrence, between Chambers and Spurgeon Creeks, and along the West Bay and East Bay peninsulas. Outside of the cities and UGAs, the peninsulas have very fragmented habitat and contain a few large areas of good condition habitat, mainly around the Woodard Bay Conservation Area, Woodland Creek in the northern stretch of Lacey, and along Shell Point (Thurston County, 2013).

There are a few small areas of the best habitat condition, located in the southern half of the watershed south of Spurgeon Creek through the foothills but north of Silver Creek, including Offutt Lake, Tempo Lake, and Joint Base Lewis-McChord. South of the City of Rainier on the south side of the Deschutes River are two areas that have good habitat condition. Also, just west of where the Little Deschutes joins the Deschutes is good habitat condition (Thurston County, 2013).

The habitats and species of concern in the Deschutes Watershed are primarily habitats and species that are either currently listed under the Endangered Species Act (ESA), are current candidates for listing, or are wildlife species and habitats of local importance. Thurston County is currently working with USFWS to develop the Habitat Conservation Plan (HCP) that will preserve prairie habitat and species. The Habitat Conservation Plan will cover the entire prairie ecosystem, rather than focusing on specific species.

In-stream and Riparian Habitat

The Deschutes Salmon and Steelhead Habitat Limiting Factors (Haring and Konovsky, 1999) report describes salmon stocks in the basin and habitat factors that are limiting to salmon recovery. The Salmon and Steelhead Stock Inventory (SASSI) report (Washington Department of Fish and Wildlife and Western Washington Treaty Indian Tribes, 1994) identifies South Sound tributaries of summer and fall chinook, two distinct stocks of fall chum (Henderson Inlet and Eld Inlet), the South Sound/Deschutes and South Sound/Deep South Sound Coho stocks, and isolated observations of Pink and Sockeye salmon (Haring and Konovsky, 1999).

Human activities have pressured salmonid habitat within the Deschutes Watershed. Loss of riparian and in-stream habitat contributes to lower quality habitat that is more vulnerable to weather impact, including floods and sedimentation. Floods have the greatest impact to salmon populations during incubation, and are worsened by loss of riparian habitat, upland forested areas, and large woody debris. In a natural river system, impacts of flooding are lessened, and the speed of water downstream is slowed. Sedimentation also has a greater impact on stream habitat that has had anthropogenic degradation. Only a few small areas of non-forested land cover on highly erodible slopes adjacent to aquatic ecosystems exist in WRIA 13, with no significant concentrations. These are primarily due to active timber harvest and are located south of the Deschutes River, and east from Reichel Lake.

Urbanization has greatly affected the riparian corridors within the Deschutes watershed, encroaching on the natural vegetation surrounding streams and creating an absences of Large Woody Debris. Priority actions in the Salmon Habitat Protection and Restoration Plan for Water Resource Inventory Area 13 (Thurston Conservation District, 2005). The primary actions to restore habitat is improved land use regulations, stormwater management and riparian vegetation restoration. Potential restoration projects for addressing limiting factors of riparian canopy include improve land use regulations, fence livestock out of riparian zones, and replant native vegetation.

Categories of Habitat Limiting Factors

The major habitat limiting factors that Haring and Konovsky (1999) identified for salmonid species are categorized to assess habitat conditions within the basin. These categories overlap, and one habitat issue could affect more than one of the following limiting categories.

Loss of Access to Spawning and Rearing Habitat

Natural features – including channel gradient, constrictions, beaver dams, and log jams – can limit salmon spawning and rearing habitat. Flow may affect whether certain physical features are barriers.

Substrate Conditions

Channel sediments present in a healthy stream are naturally dynamic and function to input, store and transport materials. Fine sediments can clog substrate gravels and impair the ability of flow to penetrate, reducing survival of salmonid eggs.

Floodplain Conditions

Floodplains function as important aquatic habitat for some species and life stages such as coho salmon juveniles that often use the sloughs and backwaters of floodplains as refuge from high flow events. Floodplains also allow water to dissipate during floods and can provide a coarse bed of sediments that flow can pass through, filtering nutrients and chemicals to maintain high water quality.

Riparian Buffer Width

Stream riparian zones in healthy watersheds are strongly influenced by climate, channel geomorphology, and where the channel is located in the watershed. Riparian zones provide hydraulic diversity, add structural complexity, provide a refuge from predators and extreme environmental events, buffer the energy of runoff events and erosion, moderate stream temperatures, and provide a source of nutrients. Riparian zones also provide a source of large woody debris to streams.

Water Quality

There are several water quality concerns in the freshwater and marine areas of WRIA 13. Some water quality concerns, including temperature, dissolved oxygen, and sedimentation, have direct impacts on salmonid survival.

Water Quantity

The basic water quantity issue of concern is alteration of the natural hydrologic regime. Alteration includes the frequency and magnitude of high flow events and reduction of summer base flows that affect the salmonid rearing capacity of streams. Streams within WRIA 13 that are currently listed on the 303(d) list are the Deschutes River and Woodland Creek. Instream flow is considered a non-pollutant, so it cannot be addressed through a TMDL.

Biological Processes

Reed canarygrass in stream channels and in adjacent riparian zones was identified for many of the drainages in WRIA 13. Reed canarygrass is typically associated with areas where LWD has been removed, and it tends to encroach on the channel, removing portions of the channel from accessible and useable area for salmonids. Reed canarygrass can also impair surface flows and eliminate identifiable surface channels.

Lake Habitat

Capitol Lake is the major limiting factor in this category within the watershed, and has high total phosphorus levels. All juvenile salmonid out-migrants and all returning adult salmonids must pass through this lake. There are a number of water quality concerns for the lake, but the information on effects to juveniles and adults is limited.

Estuarine Habitat

Juveniles of different salmon species use estuarine habitats to varying extents. Estuaries provide a transition zone between fresh and salt water that allows juveniles to migrate out and adults to migrate in. Habitat and tidal complexity can be lost due to artificial structures, including bulkheads, overwater structures, filling, dredging, and alteration of sediment process.

Assessment of Habitat Limiting Factors

The *Salmon and Steelhead Habitat Limiting Factors* report identified and rated current, known habitat conditions in the Deschutes basin. Haring and Konovsky (1999) assess habitat conditions by drainage (p. 72-96). Each drainage identifies if there is not enough information, or what pollutants are of concern and what the action recommendations are. There are many significant data gaps where there is insufficient knowledge about the current conditions. One example is Ellis Creek, which has fish passage as the primary adverse factor affecting salmonid production. As of 1999, there were five culverts assessed in the Fish Passage Barrier Database (WDFW SSHEAR, 1999). Three of the five passages are identified as current barriers (Gull Harbor Rd. NE, Boston Harbor Rd. NE, and 33rd Ave.). The recommended action in this case is to conduct a feasibility study to identify a cost effective solution to reestablish salmonid access to Ellis Creek (Haring & Konovsky, 1999).

Recovery Plans

The Thurston Conservation District Lead Entity released the *Salmon Habitat Protection and Restoration Plan for Watershed Resource Inventory Area 13, Deschutes* in 2005. This plan is a comprehensive multi-species approach for restoring and protecting salmon habitat through voluntary projects. The plan also serves to inform local priorities and project development using funding sources other than the Salmon Recovery Funding Board. Ultimately, the vision is a community that supports salmon recovery efforts through land-use and development choices that emphasize naturally functioning aquatic systems. Limiting factors are similar to those identified in Haring and Konovsky's (1999) *Salmon and Steelhead Limiting Factors* report and include fish passage, riparian canopy closure, steambank condition, floodplain connectivity, substrate embeddedness, large woody debris, pool frequency, pool quality, off-channel habitat, temperature and dissolved oxygen, water quality, flow regime and biological processes (Thurston Conservation District, 2005). Available knowledge is used in order to rank project developments, although data gaps do exist (potential carrying capacity, stream conditions, biological processes, spatial extent, and other information). Strategic goals of this plan include:

1. Protect habitat through conservation easements and acquisition where the habitat is intact.
2. Restore functions in areas where natural processes can be recovered, not just symptoms treated.
3. Address gaps in our knowledge of fish populations, fish use, and condition of natural processes.
4. Give priority to the projects that directly benefit high priority salmonid stocks.
5. Give priority to intact watersheds.

The Lead Entity Technical Committee adopted a series of guiding principles for evaluating and ranking projects and programs for inclusion on Habitat Project Lists, which is then submitted to the Salmon Recovery Funding Board for potential funding. Projects aren't required to display every principle, but each principle plays a consideration in the formal ranking process (Thurston Conservation District, 2005):

1. **The project or program achieves optimum cost benefit.**
   Project costs are well within the range of previous similar projects. Resources are limited and

competition with other WRIAs for funding is high. Projects must demonstrate a reasonable cost to benefit ratio.

2. **The project of program protects or restores natural stream functions.**
   Protection effort in WRIA 13 will focus on areas of functional habitat that have a high threat of development or land use changes that will deleteriously impact and/or have the potential to lead to aquatic habitat degradation.

3. **The project or program considers all stocks and life stages.**
   Subbasins and marine shorelines having restoration potential must incorporate habitat functions for all life history phases, including spawning, rearing and migration. The Deschutes watershed gives strong consideration to projects that benefit salmonids listed under the ESA, and to those ranked as critical or depressed. Coho populations are considered a priority stock for both restoration and protection. Chum are also a priority for restoration and preservation activities.

4. **The project or program increases the potential for natural productivity.**
   The long-term health of salmonids in WRIA 13 depends on self-sustaining salmon reproducing at sustainable levels. Ultimately, successful projects must provide a direct or indirect link to increase in salmon numbers.

5. **The program has the potential for long-term success.**
   Projects must demonstrate a certainty of success based on best available science and best management practices, a clear commitment towards monitoring and maintenance, and adaptive management approaches.

6. **The project or program addresses priority data gaps.**
   The limiting factors analysis clearly communicates the breadth of information still missing about existing conditions in WRIA 13 subbasins. Projects that address information gaps are identified as “High Priority Projects and Programs”.

7. **The project or program capitalizes on site-specific opportunities.**
   Habitat Project Lists submitted for SRFB review and funding normally reflect the Top High Priority Projects and Program Strategy. High priority projects within a subbasin will likely be endorsed, but “opportunistic” events may still arise.

A general approach of the plan is that lowland freshwater habitat that is suitable for chum spawning is considered a priority for protection and restoration. Coho are also a priority stock for both restoration and protection. This species is dependent upon the freshwater for major portions of its life stages for spawning adults and rearing of juveniles.

In order to prioritize waterbodies, the salmonid stream assessment model provides a means for ranking streams for conservation and restoration consideration using available information and professional opinion. Two equally weights resources factors are provided for consideration: biological and habitat. The ranking procedure produces two outputs: "biological potential" and "restoration potential" (Thurston Conservation District, 2005).

- Biological potential is a combination of existing and potential salmonid production, defined by the number of stocks present and available habitat. This is combined with the percentage of impervious surface cover in the watershed.
- Restoration potential is a combination of the biological potential described above and the current condition of the habitat. This score implies that the degraded system that has high biological potential would be a better candidate for restoration than the degraded system with little biological potential for improvement.

Freshwater priorities are listed in Table 16, pg. 45 based on the ranking structure (Thurston Conservation District, 2005). Tier A streams are high priority streams that would be considered first for implementation, and include the Deschutes, Green Cove, and McLane.

4.4.1 Status of Species Recovery Plans

Current conditions of important wildlife species and habitat are discussed in the previous sections, and reflect the efforts and projects that have focused on habitat restoration and preservation in the Deschutes watershed. Since the development of the *Salmon Habitat Protection and Restoration Plan*, the Lead Entity has opened up 75 miles of stream for spawning and rearing habitat; added 525 pieces of large woody debris back into streams along the shoreline; protected 475 acres of estuary, 9.5 miles of shoreline, and 469 acres of upland; recreated and reconnected 46 acres of estuaries, lagoons and saltmarsh; removed two bulkheads, restoring 510' of shoreline; surveyed 214 miles of shoreline that is crucial habitat for forage fish, juvenile and adult salmonids; planted 9.3 miles of riparian corridor; and fenced 8.8 miles of stream from livestock utilization (Thurston Conservation District, 2016).

Proposed projects for 2016 for the Deschutes Watershed under the Salmon Recovery Funding Board (SRFB) and the Puget Sound Acquisition and Restoration (PSAR) include a variety of projects, ranging from acquisition to fish passage enhancement and correction. These projects[35] include:

- **Acquisition Project Development**: This project assesses the landowner's willingness to pursue habitat protection, and agreeable landowners will be asked to make preliminary commitments. Capitol Land Trust will complete a feasibility study for three of the projects.

[35] For the full list, including sponsors, funding request, match, project cost and PRISM numbers, visit: http://www.thurstoncd.com/sites/default/files/u304/2016%20WRIA%2013%20SRFB%20and%20PSAR%20Project%20Proposals.pdf

- **Action Plan Project Development on the Deschutes**: This project will work with the Technical Assistance Group to develop and implement primary research toward the creation of an Action Plan for the mainstem Deschutes and tributaries. This plan would have an interactive element that would highlight the highest priority actions for restoration and acquisition for the watershed.
- **Butler Cove Estuary Enhancement & Fish Passage Correction**: This project proposes to remove the remaining infrastructure and invasive ivy, restoring natural estuarine function. Additionally, a culvert replacement on Windolph Loop road is proposed to increase potential estuarine habitat within Budd Inlet. These habitats are important for chum, cutthroat trout, and juvenile chinook.
- **Deschutes Prairie Restoration**: This project seeks to restore the incised channel and aquatic habitats on approximately 750 linear feet of river channel in the reach by increasing LWD, re-establishing riparian corridor, and creating in-stream complexity. This project proposes to finalize designs, engage stakeholders, and complete project construction.
- **East Fork McLane**: This project would design and implement a culvert replacement on a private driveway to address fish passage concerns. The project property is an 11 acre horse farm located on the east form McLane Creek in the Eld Inlet Watershed of Thurston County. The landowner has actively been seeking restoration assistance and will be implementing a 100 foot riparian buffer with exclusion fencing for horses in 2016.
- **Harmony Farm Restoration**: This project will implement salmon habitat restoration on 55-acres on this marine shoreline. Restoration will include removing derelict structures, invasive plant removal, and native plant revegetation.
- **Little Fish Trap Restoration**: This project will restore the pocket estuary and altered barrier spit adjacent to a small freshwater salmon stream and tidal channel. The project will remove armoring to restore natural processes which will naturally reshape the spit. Additionally, the project will remove the non-functioning eco-blocks and debris from along the toe of the bluff and install several large pieces of unanchored wood with root wads parallel to the beach.
- **Lower Henderson Acquisition**: Conserve 106 acres and 5,800’ of shoreline on two adjacent properties – Stillman Tree Farm (51-acres) and Harmony Farm (55-acres).
- **Spurgeon Creek – Fox Hill Restoration**: This project proposes to re-mender a ditched channel through the adjacent wet fields just south of a private driveway and north of and below the Fox Hill development. The project would advance conceptual designs to 90% designs and construct the project. However, this project could be scaled to include the 60% designs and permitting.

The *2011 Three Year Work Program for the South Sound Watersheds* (Puget Sound Partnership, 2011) provides an update on the marine, near-shore, estuarine, and freshwater projects throughout WRIA’s

11, 13, and 14, and portions of WRIA's 10, 12, and 15. The work program breaks projects down into watersheds and sound-wide actions. Actions that were accomplished within WRIA 13 include:

- The removal of creosote pilings and a large dock and bulkhead at the DNR marine research and storage area on Budd Inlet;
- Continuing to restore Woodard Bay Natural Area preserve;
- Completion of Beachcrest estuary and fish passage, restoring 1.5 acres of estuary habitat used for rearing; removal of derelict home structures followed by estuary impoundments at Allison Springs in Eld Inlet;
- Outreach to landowners in McLane Creek, an extremely productive system with landowner difficulties;
- Designs for the Deschutes River LWD placement;
- Purchase and sale agreement for the ILF on the Deschutes River Wetland Enhancement Project;
- Extensive landowner outreach on Spurgeon Creek, one of two cold water refuges on the Deschutes;
- Work with St. Martins on Woodland Creek in Henderson Inlet to remove debris from the stream channel, revegetate the site and restore fish passage;
- Alternative analysis of Woodard Bay NAP;
- ACOE 10% design on Deschutes Estuary restoration proposal;
- ACOE 10% design on Mission Creek restoration proposal.

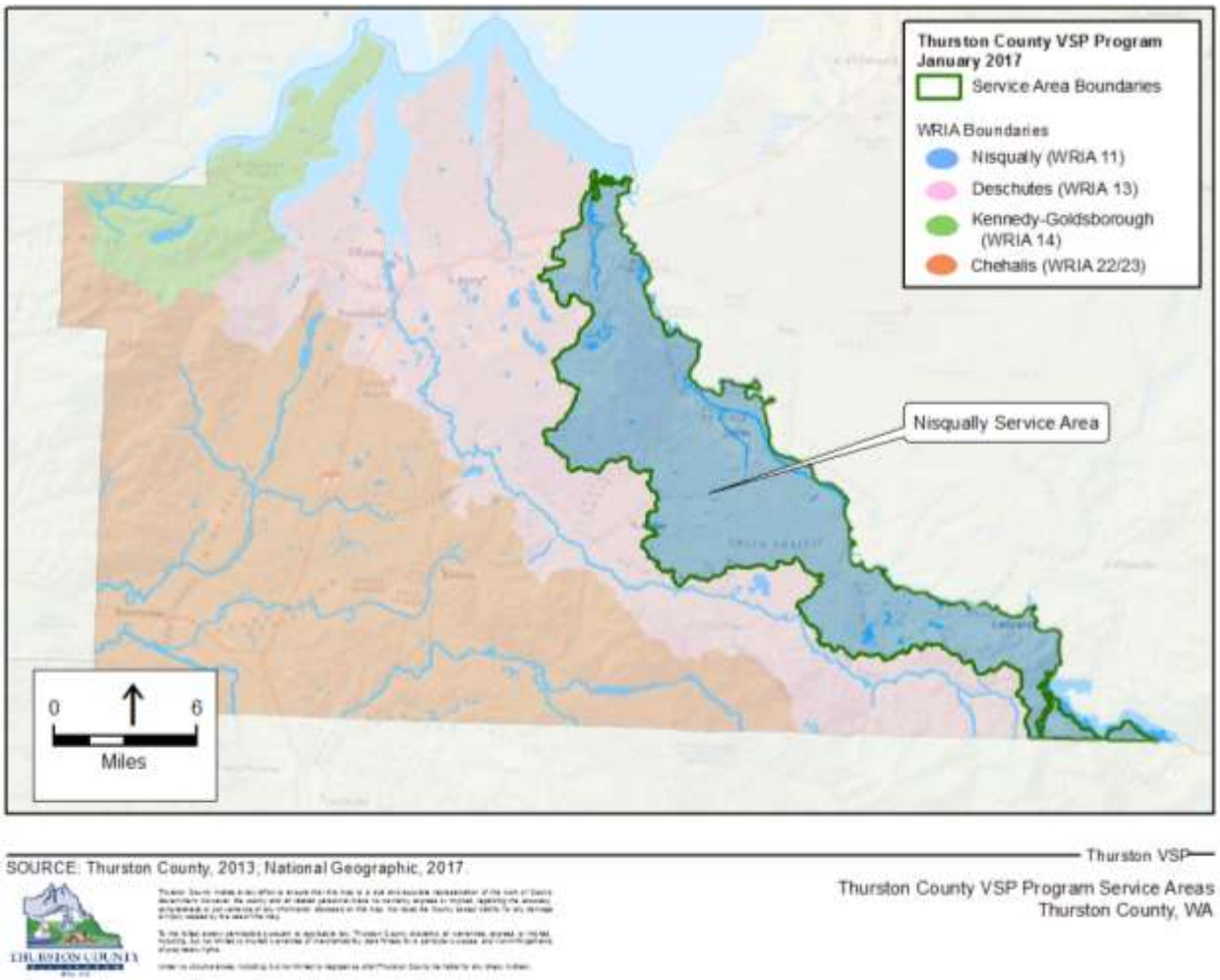
The WRIA 13 Salmon Habitat Recovery Committee continues to collaboratively identify and develop salmon habitat recovery projects. From July 1, 2015 through June 30, 2017, there is a $53,986 budget that will be distributed amongst parties meeting the requirements for implementation, deliverables and timelines. Final awards and grants are announced in December.

5 Nisqually Watershed Existing Information and Baseline Conditions

The Nisqually ranks third in the county for baseline agricultural activities by acreage with 26,000 acres of agriculture activities, behind the Chehalis (62,241 acres) and Deschutes (30,900 acres) Watersheds. When calculated to a percentage – the amount of agriculture activities divided by the total acreage of the watershed – the Nisqually Watershed has the second highest percentage of land that is agricultural activities at 5.29%, behind the Deschutes at 14.6% of land being dedicated to agriculture activities.

The effective date of the VSP legislation is July 22, 2011. This is the statutory date for identifying the applicable baseline for county requirements related to protecting a particular critical area, and for maintaining and enhancing agricultural viability. This baseline also delineates the assessment line between critical area protection and voluntary enhancement that may be promoted where needed, through incentive-based measures, to improve critical area functions and values above the July 22, 2011 protection baseline. (RCW 36.70A.703)

Figure 3: Outline of the Nisqually Watershed in Thurston County



5.1 Watershed Management Data and Plans

The Nisqually Indian Tribe released a watershed management plan in 2003 as part of the voluntary watershed planning process called for by the Watershed Planning Act (ESHB 2514) that was passed in 1998 by the Washington State Legislature. This watershed planning was intended to allow for local input and collaborative planning with the goal of supporting economic growth and providing equitable and effective water resource management to sustain viable and healthy communities. These plans are required to address water quantity by assessing water supply and use within the watershed. They may also include the optional elements of water quality, in-stream flow, and habitat. The Nisqually Watershed Plan addresses all four aspects. This plan addresses watershed planning at two scales: watershed-wide and sub-basin. The Nisqually Watershed Plan is the product of four years of collaboration including federal, state and local governments, the Nisqually Indian Tribe and other interested citizens to identify water issues within the watershed and develop a comprehensive strategy for balancing water needs with preservation. The Nisqually Planning Unit was approved April 12, 2000

with the following mission: “to maximize the ability of the Nisqually Watershed to produce high quality groundwater and surface water, while protecting and managing the related resources to support environmental, social, economic, and cultural values” (Nisqually Indian Tribe, 2003). The Watershed Management Plan was approved October 31, 2003 and adopted in April 2004. Goals and objectives in the plan focus on water quality, water quantity, in stream flow, and fish habitat. In addition to developing several recommended actions, implementation and SEPA strategies for the watershed and sub-basins, the Nisqually River Council also developed a Detailed Implementation Plan intended to guide the Watershed Management Plan, completed in April 2007.

The Nisqually River Watershed Characterization Report was developed by Thurston County Geodata and Resource Stewardship in September, 2013. This plan identifies natural resource areas that could potentially serve as restoration or enhancement sites to mitigate past and future development within the watershed. This report identifies landscape attributes used to characterize the condition of ecological processes (movement of water, large woody debris, sediment, pollutants, and heat) and upland habitat connectivity that could be affected by the built environment (Resource Stewardship & Geodata, 2013). This is accomplished using existing land cover and natural resources data to develop databases that identify the location and condition of wetland, riparian, and floodplain resources.

5.1.1 Recommendations and Suggested Actions

Nisqually Watershed Management Plan

Growth and Land Use

- Consider water supply availability in city and land use planning activities.
- Demonstrate how infrastructure needs will be met for intensified land uses at the time of development.
- Address Urban Growth Area expansions that are outside the jurisdiction of a served water area and document the intention and ability to provide water.
- Retain and provide adequate water supply to agricultural land of long-term commercial significance.
- Ecology should not grant permits for transfers of existing water rights from designated agricultural lands, unless long-term arrangements are made for a suitable surrogate source.

Groundwater Resources and Supply

Regional Supply

- Identify the Nisqually Aquifer as a possible source of regional water supply.
- Investigate the feasibility of development of a regional water supply in the McAllister sub-basin that does not negatively impact existing water right holders and has least impact to surface waters.

Groundwater Divides

- In cases where WRIA boundaries differ from groundwater boundaries, develop a policy for coordination and congruence for groundwater that does not follow boundaries.
- Address locations of groundwater divides through a joint study to identify divides between WRIAs 11 and 12.

Critical Aquifer Recharge Areas

- Preserve the long-term integrity of recharge areas in both quantity and quality.
- Coordinate collection of relevant technical information regarding recharge areas.
- Prioritize for expedited clean up land uses within critical recharge areas that are shown to contaminate groundwater or soils.

Exempt Wells

- Ecology provide more thorough oversight of exempt wells.
- Ecology investigate the cumulative impacts of exempt wells and consider setting a basin-wide standard.
    - Evaluate hydrologic impacts of exempt wells on surface and groundwater resources.
    - Assess effectiveness of current exempt well withdrawal statute and implementation practices.
    - Require decommissioning of existing old wells when they have been replaced.
    - Identify rule or policy needed to ensure effective implementation.

Water Rights and Closed Watersheds

- Ecology process water right applications in batch processing by sub-basin, order of processing dependent on adequate data.
- Staff Ecology at a level that ensures timely response to water right applications and oversight and monitoring of withdrawals within the watershed.
- Provide mitigation strategies (see the Nisqually Watershed Management Plan, pg. 53) for water right holders and applicants to improve supply.
- Provide credit for reclaimed water.
- Address ambiguity between water quality and water resources statutes to encourage reclaimed water projects.

Instream Flows

- Support protection of resources by maintaining closures unless new technical information suggests otherwise.
- Gain a better understanding of technical basis for stream closures watershed-wide.
- Identify flow of compromised streams based on intermittent nature, including installation of gauging stations on Yelm Creek, Muck Creek, Powell, Murray, Toboton, Tanwax, and Horn Creeks.
- Examine groundwater and surface water continuity issues as they relate to water rights processing in Yelm and Eatonville.

- Identify and examine methods of surface water augmentation, including but not limited to reuse, artificial recharge, or storage-related projects.

Water Quality

- Implement a watershed-wide Water Quality Monitoring Plan that was created in conjunction with the Nisqually Watershed Management Plan.
- Use and maintain the Nisqually Water Data System.
- Convene a workgroup to address potential inconsistencies in handling pollutants between federal and state agencies and utilities.
- Address land uses that may threaten watershed health.
- Ensure adequate water quality monitoring of groundwater in designated critical aquifer recharge areas.

5.1.2 Detailed Implementation Plan Strategies

The Nisqually Indian Tribe began the process of addressing the goals and recommendations of the Nisqually Watershed Management Plan through the Nisqually Detailed Implementation Plan. This plan was developed over a period of months following the development and adoption of the WMP (April 2004). Many of the original members of developing the Watershed Management Plan were included in the development of the DIP – along with new members – from local, state, federal and tribal governments, as well as local agriculture and environmental representatives. All funds of the Implementation Plan are generated through grants and in kind donations. The critical actions from the DIP for short-term and long-term water resource management in WRIA 11 include: identify aquifers for potential supply; recommend to Ecology to batch process water right applications by sub-watershed; assess, negotiate and possibly undertake rule-making for minimum instream flows on the Mashel River; monitor the quantity and quality of stream flows and groundwater supplies; understand the interconnection between groundwater and surface water, including the impact of exempt wells on groundwater; and, strengthen the Coordinated Water System Planning policies to provide a more direct link between land use planning and water supply availability.

Development of the Watershed Management Plan occurs through four phases: 1) organize a Watershed Planning Unit, 2) assess existing conditions and develop technical assessments of water resources, 3) develop and adopt a Watershed Plan, and 4) develop an implementation plan to carry out the recommendations and obligations of the watershed plan. The DIP falls under Phase IV planning funds and has policy statements, management strategies, and projects organized around key issues of growth and land use, groundwater resources and supply, water rights, instream flows and surface/groundwater continuity, and water quality.

Thurston County Actions:

- Growth & Land Use

- GLU-1: Water supply availability should be considered in city and county land use planning activities.
- GLU-1a: Look for opportunities to resolve inconsistencies between Pierce and Thurston CWSPs so that they are consistent in their review and coordination of Water System Plans.
- GLU-1c: Recommend that a countywide CWSP for Thurston County be developed as a means to implement recommendations identified in this section including ensuring adequate water supply and limiting the numbers of exempt wells when alternate supply is available.
- GLU-1d: Develop linkage between issuance of water availability certificates and exempt wells in areas encompassed by a CWSP.
- GLU-1e: Recommend that CWSPs address water rights associated with failed water systems.
- GLU-1f: CWSPs should require purveyors to provide counties information about how much water is available for hook-ups through approval of Water System Plans.
- GLU-2: Amendments to the Comprehensive Plan land use designations that intensify land use should demonstrate how infrastructure needs will be met at the time of development.
- GLU-3: For proposed Urban Growth Boundary expansions that are outside the water service area, include documentation on the intent and plan to provide water.
- GLU-4: Adequate water supply should be retained on and provided to designated agricultural land of long-term commercial significance and other important agricultural areas.

- Groundwater Resources
  - GW-5 (AR): Address Aquifer Recharge Areas under Critical Areas Ordinances to preserve the long-term integrity of recharge areas.
  - GW-5a (AR): Yelm and Olympia – During any amendments mandated by the GMA, evaluate CAO adequacy, data supporting them, and whether or not they provide adequate production.
  - GW-5b (AR): Ensure process is in place to obtain input of municipalities when a CAO is updated.
  - GW-5c (AR): Coordinate the collection of relevant technical information regarding recharge areas and assure it is available during CAO updates.
  - GW-5d (AR): Perform jurisdictional review of CAOs and include the following activities.
  - GW-5e (AR): Land uses with potential to pollute groundwater in CARAs should have priority for clean-up.
- Water Quality

- WQ-3: Convene a workgroup to address potential inconsistencies in handling of pollutants between federal and State agencies and utilities.
- WQ-5: Ensure adequate water quality monitoring of groundwater in designated critical aquifer recharge areas.
- WR-1: Recommends Ecology batch process water right applications by sub-basin.
- WR-3: Recommended mitigation strategies for water rights processing.

Separate tables with lists of actions also exist for the Yelm, WDFW, Water Conservancy Board, Thurston PUD, Tacoma Power, Roy, Pierce County, Olympia, Nisqually Indian Tribe, Lewis County, Lacey, the Implementing Body, Fort Lewis, Eatonville, Department of Transportation, Department of Health, and the Department of Ecology.

The Detailed Implementation Plan also details an implementation schedule of Plan actions and is summarized on a year-by-year basis. Implementation of actions is subject to funding, legislative action, availability of data, staffing and commitment of the stakeholders to the group. There are six sections of the implementation schedule identified in the DIP: completed actions as of January 2006 (table 4-1), actions for implementation in 2006 (table 4-2), actions for implementation in 2007 (table 4-3), actions for implementation in 2008-2010 (table 4-4), long term actions for implementation (table 4-5) and actions with unknown timelines (Nisqually Indian Tribe, 2007).

5.1.3 Status of Watershed Management Plans

At the time the DIP was developed, a list of completed actions as of January 2006 were identified and included (table 4-1, Nisqually Indian Tribe, 2007). This included:

- GLU-4: Adequate water supply retention on and provided to designated agricultural land of long-term significance;
- GW-5: Address Aquifer Recharge Areas under Critical Areas Ordinances to preserve the long-term integrity of recharge areas (in quantity and quality);
- GW-5a: During any amendments mandated by the GMA, evaluate the adequacy of Critical Areas Ordinances, data supporting them, and whether they provide adequate protection;
- GW-5b: Ensure process is in place to obtain the input of municipalities when a Critical Areas Ordinance is updated;
- GW-5c: Coordinate the collection of relevant technical information regarding recharge areas and assure it is made available during updates of critical areas ordinances;
- WQ-1: Implement watershed-wide Water Quality Monitoring Plan.
- WQ-2: Maintenance and use of the Nisqually Water Quality Data System.
- MO-6: Seek funding to update WSP.
- MO-10: Evaluate supply potential.

A progress update has not been made on the status of implementation since the publication of the Detailed Implementation Plan.

5.2 Water Quality Data and Plans

Washington State Department of Ecology sets water quality criteria to protect beneficial uses (also known as designated uses), including public water supply, protection for fish such as salmonid spawning, rearing and migration habitat, protection for shellfish and wildlife, as well as recreational, agricultural, industrial, navigational, and aesthetic purposes[36]. The water quality criteria are applied along with the designated uses for every waterbody in the state. The following tables provide water quality parameters and criteria for water bodies in the Nisqually Watershed.

Table 24. Water Quality Standards: Eaton Creek – beneficial uses include core summer salmonid habitat and extraordinary primary contact[37]

Parameter	Condition	Value
Temperature	Highest 7- DADMAX.	16º C.
Dissolved Oxygen	Lowest 1 day minimum.	9.5 mg/L.
Turbidity	Turbidity shall not exceed:	5 NTU over background when background is <= 50 NTU -or- 10% increase in turbidity when background is > 50 NTU.
pH		Range within 6.5 – 8.5, with a human-caused variation within the above range of < 0.5 units.
Bacteria		Fecal coliform organism levels must not exceed a geometric mean value of 50 colonies/100mL, with not more than 10% of all samples (or any single sample when less than 10 sample points exist) obtained for calculating the geometric mean value > 100 colonies/100 mL.

Table 25. Water Quality Standards: Nisqually River Mainstem from mouth to Alder Dam (RM 44.2) – beneficial uses include core summer salmonid habitat and extraordinary primary contact

Parameter	Condition	Value
Temperature	Highest 7- DADMAX.	16º C.
Dissolved Oxygen	Lowest 1 day minimum.	9.5 mg/L.
Turbidity	Turbidity shall not exceed:	5 NTU over background when background is <= 50 NTU -or- 10% increase in turbidity when background is > 50 NTU.
pH		Range within 6.5 – 8.5, with a human-caused variation within the above range of < 0.2 units.

[36] For more information visit the Department of Ecology's State of Washington website for *Surface Water Quality Standards* http://www.ecy.wa.gov/programs/wq/swqs/index.html.
[37] This table is adapted from Ecology's *Water Quality Atlas* http://www.ecy.wa.gov/programs/wq/303d/currentassessmt.html

Bacteria		Fecal coliform organism levels must not exceed a geometric mean value of 100 colonies/100mL, with not more than 10% of all samples (or any single sample when less than 10 sample points exist) obtained for calculating the geometric mean value > 200 colonies/100 mL.

Water Quality Assessment and Impairments

The Federal Clean Water Act requires Washington State to prepare a list of all surface waters in the state that are impaired by pollutants. Washington's Water Quality Assessment (Sections 303(d) and 305(b) integrated report) identified polluted waters that are documented in the online mapping tool. The Water Quality Assessment integrated report divides waterbodies into five categories based on the assessment of available and credible water quality data:

- Category 1—Meets tested standards for clean water
- Category 2—Waters of concern
- Category 3—Lack of sufficient data
- Category 4—Polluted waters that do not require a TMDL because the problems are being solved in one of three ways:
  - 4a—Has an approved TMDL and it is being implemented
  - 4b—has a pollution control plan in place that should solve the problem
  - 4c—Is impaired by a non-pollutant such as low water flow, dams, and culverts
- Category 5—Polluted waters that require a TMDL – the 303(d) list

There are temperature and DO problems throughout Thurston County, the following lists the polluted waters that require a TMDL (the 303(d) list) from the current (2012) EPA-approved assessment:

- Clear Lake – Total Phosphorus
- Mashel River – Temperature
- Ohop Creek – Dissolved Oxygen

Nutrients and Dissolved Oxygen

Nitrogen is a commonly measured nutrient for water quality. Nitrate is a source of nitrogen and is essential for plant and animal growth. However, overabundance in streams can cause adverse ecological effects, including overstimulation of algal growth that results in oxygen depletion and light blockage. Common sources of nitrogen include fertilizers for agriculture and sewage. Nitrate can enter the water as a result from runoff of fertilizers that contain nitrogen. Oxygen dissolved in lakes, streams and rivers is necessary for organisms to survive. When the amount of dissolved oxygen drops below normal levels in waterbodies, animals can begin to die off. Dissolved oxygen is generally lower in stagnant water and waterbodies with high algal growth (caused by nitrogen and phosphorus).

Two primary anthropogenic causes of nutrient loading (and in turn, low dissolved oxygen) include failing on-site septic systems and storm water runoff of nutrients from human and animal wastes and fertilizers. Routinely checking septic systems, keeping soaps out of streams, preventing overuse and runoff of fertilizers, managing domestic animal waste, and keeping grass clippings and other organic debris can minimize nutrient runoff into waterbodies.

Two of three waterbodies listed on the 303(d) that require TMDL or WQI plan are for nutrients and dissolved oxygen. Clear Lake is listed as a category 5 in the current (2012) EPA-approved assessment for total phosphorus. Data collected by Thurston County and the Department of Ecology show eutrophic conditions and impacts to recreation caused by severe algae blooms. Two basis were removed in 2006, but the listing was not reassessed and was kept as a Category 5 for the next 2 listings. Ohop Creek is listed as a category 5 in the current (2012) EPA-approved assessment for dissolved oxygen. Some streams, such as McAllister Creek, has low dissolved oxygen due largely to natural conditions, including a combination of low dissolved oxygen in the groundwater, wetland influences, and physical conditions that hamper re-aeration.

Temperature

Water temperature is important for the health and survival of native fish and aquatic communities. Temperature affects embryonic development, juvenile growth, adult migration, competition, and potential for disease. Salmonid species such as bull trout, Dolly Varden, and Char now have more stringent temperature criteria and are protected by Washington State surface water quality standards. The highest 7-DADMAX for Char spawning and rearing habitat is 12 °C; for core summer salmonid habitat is 16 °C; for salmonid spawning, rearing and migration is 17.5 °C; and for salmonid rearing & migration only is 17.5 °C.

Lack of riparian shade, excessive sediment, and low stream flow can all contribute to a rise in temperature. Land management activities including forest management, grazing and agriculture may affect temperature adversely where they damage vegetation adjacent to streams, cause excessive erosion of stream banks, add sediment to streams, reduce instream flow, or return warmed water to streams (Ecology, 2000). Actions to improve stream temperature include to repair and replace native riparian vegetation and return stream flow.

The Mashel River within the Nisqually watershed is listed as a Category 5 in the current (2012) EPA-approved assessment for temperature, requiring a TMDL plan. At River Mile (RM) 06, a 7-day mean of maximum daily temperature at 19 °C was recorded, with a maximum daily temperature of 20.2 °C from continuous measurements collected in 1993 (Ecology, 2012). Data also shows exceeding 7-day mean temperatures and maximum daily temperatures for 1994 and 2001.

Bacteria

Fecal coliform is a type of bacteria common in human and animal waste. Presence of this bacteria serves as an indicator organism that other pathogenic bacteria are likely present. This could lead to contamination water and aquaculture. Presence of this bacteria is caused from runoff of human and animal waste, poor septic maintenance, and untreated sewage. Septic systems can become overloaded if left untreated and flow into streams and groundwater. Agricultural practices, including spreading manure and fertilizer during rainy seasons, can result in fecal coliform flowing into surface waters.

Tools to prevent fecal coliform from entering streams includes regular maintenance of on-site septic systems, managing pet waste, and monitoring spread of manure in the rainy season. Currently in Thurston County, farmers can spread manure and fertilizers on their land from spring to fall.

5.2.1 Status of Water Quality Improvement Projects

A Total Maximum Daily Load (TMDL) study in the Nisqually River Basin was established for fecal coliform bacteria and dissolved oxygen. *Load allocations* are pollution that come from diffuse (nonpoint) sources. *Wasteload allocations* come from discrete (point) sources, such as discharge from a wastewater treatment plant. The Nisqually River, Nisqually Reach, and McAllister and Ohop creeks are on the 303(d) list of waterbodies that do not meet water quality standards. All of the above are listed for fecal coliform, and McAllister Creek is also listed for dissolved oxygen. The TMDL study is based off of the 1996 303(d) and the 1998 303(d) listed waterbodies.

Several recommendations were made in the TMDL study (Sargeant *et al,* 2005). For the Nisqually River and Nisqually Reach, recommendations included to begin regular monitoring of Sequalitchew Creek for fecal coliform, test septic systems east of the Nisqually flats, and to reclassify from category 5 to category 1 on the 303(d) list. For Ohop Creek, it was recommended to investigate storm water sources on Lynch Creek, investigate dry season sources of bacteria, and investigate agricultural sources along the ditch paralleling Ohop Creek. For Red Salmon Creek, it was recommended that livestock are to be excluded from waterways and wet areas year-round and on-site sewage be investigated adjacent to Wash Creek. McAllister Creek had recommendations for dissolved oxygen and fecal coliform bacteria. For fecal coliform bacteria, it was recommended to investigate potential sources in the Meadows subdivision, continue to work with the Luhr Beach neighborhood to manage on-site sewage and pet waste, limit annual access to ditches and waterways, revegetate along McAllister Creek riparian area, install a pet waste station along the McAllister Creek dike path, install portable toilets at creek access points, and inspect on-site sewage between RM 4.7 and 4.5 on McAllister Creek and RM 0.3 and mouth on Medicine Creek. Dissolved Oxygen recommendations for McAllister Creek included to investigate possible widespread changes in groundwater nitrate, investigate possible anthropogenic sources of nitrogen to groundwater, apply fertilizers at agronomic rates with a no-application buffer zone adjacent to waterways, implement measures to control bacterial sources as a means of controlling nutrient and bacterial sources, and use dissolved oxygen levels at McAllister Creek RM 5.8 as freshwater dissolved oxygen criteria for the creek.

Sampling was conducted June 2002 through August 2003 for McAllister Creek, which was placed on the 303(d) list of impaired waters for both bacteria and dissolved oxygen. A summary report (2009) for fecal coliform levels in McAllister Creek. Implementation efforts to reduce bacteria have moved forward as a result of the TMDL, including planned agricultural implementation efforts (e.g. fencing). Protection of beneficial uses, such as human health and shellfish beds has been an on-going concern in the McAllister / Nisqually Reach area. Between River Miles (RM) 3.7 and 3.1, McAllister Creek exceeded both parts of the fecal coliform standard for extraordinary primary contact. Recommendations moving forward include investigating potential sources of fecal coliform bacteria resulting from human activities (agriculture, pet waste, septic systems), implement BMPs where sources of fecal coliform bacteria concentrations are identified, and maintain BMPs to ensure on-going effectiveness.

Department of Ecology also conducted a water quality monitoring study for Medicine Creek during the 2007/2008 wet season. Medicine Creek is a tributary to McAllister Creek that flows into the Nisqually Reach and was found to have elevated fecal coliform bacteria and nitrates during the Nisqually River Basin TMDL study. Water samples were collected during low tide for fecal coliform and nitrates at RM 0.3 and RM 0.05. The state water quality standard for extraordinary primary contact was met at both sites, although bacteria concentration increased at the downstream site (RM 0.05). There are no state water quality standards for nitrates and nitrites, but the concentrations of these exceeded EPA's guidance for this region. Recommendations moving forward include to target storm events for future wet seasoning monitoring, monitor fecal coliform bacteria concentrations during the summer months to characterize conditions during low flow, and investigate sources of nitrogen in the lower reach of the creek.

Implementation Activities

A Water Quality Implementation Plan (WQIP) was developed for the Nisqually River Basin to improve dissolved oxygen and fecal coliform to water quality standards (James, 2007). There were no prescriptions for correction of the low dissolved oxygen levels in McAllister Creek. Suggestions were made to investigate the natural condition of the creek further, and incorporate BMPs handled under fecal coliform strategies.

The Nisqually River, Nisqually Reach and Ohop Creek were on the 1996 303(d) list of water bodies that did not meet standards for fecal coliform. Ohop Creek has greatly improved since 1990, but load allocations were identified for several sites downstream of Ohop Lake in the dry season and one tributary – Lynch Creek – in the wet season. The four main areas of the Nisqually Fecal Coliform Implementation Plan are Red Salmon Creek, Ohop Creek, Lynch Creek and McAllister Creek. The goal of this plan is to reduce the amount of fecal coliform reaching water bodies within the watershed. Primary attention is on agriculture, storm water, and on-site sewage systems. In order to meet water quality standards within the watershed, several strategies are laid out in the plan are summarized below (James, 2007):

- On-site Sewage Systems:

    - Thurston County will continue to investigate failing sewage systems in the area of Luhr Beach, and any other areas brought to their attention.
    - Thurston County will provide financial assistance to homeowners through loans and grants (secured throughout 2011 at the time of the report) to repair failing on-site sewage systems.
    - Thurston County will conduct workshops and outreach near areas of concern.
- Pet Waste:
    - Place a pet station near the WSDOT property near exit 114 and I-5, or eliminate access for pet walkers on the dike.
- Agricultural Practices:
    - Restoration project in the Ohop Creek area between the Nisqually Tribe and Pierce Conservation District, with some water quality improvements including fencing of livestock, removal of drainage tiles to allow filtering of runoff, and filtering of runoff through streamside plantings.
    - Thurston Conservation District to work with landowners in the Nisqually Basin to implement best management practices and develop conservation plans.
- Stormwater:
    - Thurston County will implement some BMPs listed in the Washington State storm water manual on ditches that are publicly owned to help the reduction of fecal coliform.
    - Perform monthly monitoring on McAllister Creek near the I-5 bridge.

Implementation monitoring in the Nisqually Basin included a few entities that have funded sampling programs: Thurston County (once monthly on McAllister Creek near I-5), Washington Department of Health (twice a year at the Nisqually Reach), and Pierce County Water Program. Many stakeholders at the time of the WQIP were already implementing bacteria reduction activities, including septic repairs, investigating agricultural sources of pollution and repair of fences, and investigating storm water contributions.

5.3 Farmland Protection Data and Plans

The Thurston County Comprehensive Plan (2004) addresses rural land use and resource lands, including agricultural, forestry, mining and aquaculture. The Natural Resources chapter (chapter 3) describes strategies for accomplishing the GMA goal of maintaining and enhancing natural resources (RCW 36.70A.020). An overriding philosophy of this chapter within the Plan is that in order to preserve agricultural land for future generations, the business of agriculture must remain economically viable. Agricultural lands of long-term commercial significance are required to be designated under the Growth Management Act. Criteria for designating such lands in Thurston County includes: soil type, availability of public facilities and services, land capability and tax status, relationship or proximity to UGAs, predominant parcel size, land use settlement patterns, proximity of markets, agricultural diversity, and environmental considerations.

The Working Lands Strategic Plan presented specific strategies to conserve working lands and those who work them. Strategies are classified into four categories, including: Working Lands Advocate, Economic Sustainability, Regulatory and Political, and Education and Outreach. County-wide planning policies support a role for Thurston County in an economic development function and provide appropriate context for strategies within the Working Lands Strategic Plan. These strategies are discussed in further detail in Section 1.

The American Farmland Trust study recommends strategies for Thurston County to better protect farmland, including zoning changes to areas surrounding LTA from Rural 1/5 to Rural 10 and/or Rural 20 and increasing the CFT rate to the maximum of 6.25-cents per $1000 dollars. The primary recommendations for farmland protection in Thurston County from the AFT study are listed under *section 3.3.*

The Nisqually Stewardship Plan shares a 2055 vision of no net loss of farmlands from the 2005 productivity levels, balance between incentives and regulations, and a stronger connection between rural and urban around the understanding of local farming and its needs (Nisqually River Council, 2009). This vision is separated into goals, objectives and actions:

- 2030 Goal: previously developed conservation (farm) plans are fully implemented;
- 2020 Objectives: conservation (farm) plans developed for all commercial farms, incentives created that promote purchase of development rights and conservation easements, and conservation plans for small farms requested by owners;
- 2015 Actions: Provide technical assistance to farmers for sustainable agriculture, promote the local farming economy with markets and community supported agriculture programs, and achieve a balance between incentives and regulations in the agriculture sector;
- 2010 Actions: Develop a pamphlet for new small farmers and promote the connection between the urban and rural community.

Status of Farmland Protection Programs

Thurston County's Long Term Agriculture (LTA) districts are mostly located in isolated pockets in the southern portions of the county. There are several pockets of LTA zoning within the Nisqually Watershed, generally surrounded by RRR 1/5 but also RR 1/5. Currently, there are 984 acres of Nisqually Agriculture and 3,440 acres of Long Term Agriculture within the Nisqually Watershed in the 2016 Thurston County zoning layer (dated June 20, 2016). In the 2011 zoning layer (dated March 17, 2011), there are 984 acres of Nisqually Agriculture and 3,480 acres of Long Term Agriculture. There is a 40-acre decrease in lands protected as Long term Agriculture from 2011 to 2016. Properties enrolled in the Open Space Tax Program are valued at their current land use rather than their "highest and best" use. Landowners who voluntarily commit to continuing agricultural uses may apply for current use classification, which results in significant property tax savings and helps reduce pressures to convert farmland. In the Nisqually Watershed as of 2016, 8,554 acres are designated current use Open Space Agriculture in the Assessor's Program. Additionally, 325 acres are designated as farm and agriculture

conservation land in the Commissioner's program. In 2011 (from a parcel layer dated July 1, 2011) there were 8,817 acres in the Assessor's Open Space Program and 534 acres in the Commissioner's Open Space Program. In total, 10,875 acres of agricultural land were protected through zoning and/or open-space tax programs in the Nisqually Watershed in 2011. Since 2012, the Thurston Conservation District has continued to work with farmers to develop farm plans, nutrient management plans, and Conservation Reserve Enhancement Program (CERP) Plans. In the Nisqually Watershed between 2012 and 2016, seven conservation plans were developed.

In 2014, the Nisqually Indian Tribe received a grant from the Salmon Recovery Funding Board in designing floodplain restoration at Wilcox farm. This grant was used to assess restoration feasibility and complete a preliminary design for a project to reconnect and restore the Nisqually River floodplain at Wilcox Farm, improving spawning and rearing habitat for Chinook salmon and steelhead. McKenna Creek Reach Ranch Protection was another project funded by the Salmon Recovery Funding Board in 2013. This grant funded the Nisqually Land Trust to buy 250 acres and a mile of the Nisqually River shoreline in Yelm, Thurston County. This land includes the headwaters of McKenna Creek, which is important for salmon recovery and protection. This land at McKenna Creek Ranch is currently zoned Long Term Agriculture.[38]

5.4 Species Recovery Data and Plans

Terrestrial Habitat

Within the Nisqually watershed in Thurston County, the worst wildlife habitat condition is surrounding the Lacey UGA, primarily on the southern side, and surrounding the Yelm UGA. The best wildlife habitat is at the Nisqually Reach and also within the southeastern portion of the watershed in designated timber land. The remainder of the watershed is patchy medium to high habitat condition. Joint Base Lewis McChord and the Nisqually Indian Reservation are also good quality wildlife habitat. Priority Habitat and Species (PHS) areas according to Washington Department of Fish and Wildlife's Priority Habitat and Species mapping exist primarily within two areas of the watershed.[39] The Nisqually Reach and National Wildlife Refuge ranging south along McAllister Creek to McAllister Springs is priority habitat for waterfowl breeding and western pond turtles, and is currently zoned as public parks (within the refuge) and Nisqually Agriculture. The second large tract of PHS habitat is in the central-western part of the watershed beginning north at SR 507, south to 153rd Ave SE, and east to Bald Hill Rd SE. This land is zoned primarily RRR 1/5, with the eastern portion containing a tract of Long Term Agriculture. It is considered priority aquatic habitat for freshwater forested and shrub wetlands, and for waterfowl

[38] For a list of all the projects that have been funded (including restoration, planning, and other), use the search tool at: https://secure.rco.wa.gov/PRISM/search/ProjectSearch.aspx

[39] For more information or to see areas of Priority Habitat and Species, visit: http://apps.wdfw.wa.gov/phsontheweb/

breeding. Other small land designated as PHS include waterfowl concentration and freshwater emergent wetlands at Eaton Creek, Raymond Ditch and Spurgeon Creek, zoned as McAllister Geologically Sensitive Area. Cliffs and bluffs are also designated as a PHS area along the Thurston-Lewis county border in the far southeastern corner of the watershed. There are four contaminated terrestrial sites within WRIA 11: 1) within the City of Lacey's UGA, 2) south of I-5 along the railroad track, 3) south of Clear Lake, and 4) south of the City of Yelm (Thurston County, 2013a).

The Nisqually National Wildlife Refuge is the major public preserve within the Nisqually Watershed. A major restoration project in 2009 helped to restore 762 acres of estuary by removing dikes within the refuge. The refuge is home to over 200 species of birds and many mammals, amphibians, reptiles, and fish. Additionally two federally threatened species, the Peregrine Falcon and Coho Salmon, inhabit the wildlife refuge. The Refuge also contains priority habitat area, including riparian forest, river, seasonal freshwater wetlands, permanent freshwater wetlands, coniferous forest, estuary and open salt water.

Terrestrial ecosystems within the watershed include forests, grasslands, meadows, croplands, pastures and urban green spaces. These ecosystems provide services, including provisioning services (food, fiber, medicine), regulating services (erosion, storm protection, water flow), supporting services (nutrient cycling, soil formation, habitat) and cultural services (spiritual, tourism, aesthetic) (Batker *et al.,* 2009). Thurston County's HCP will cover the entire prairie ecosystem, and focus on habitat protection as opposed to specific species protection. This will help to protect populations that are on the decline and prevent listing of species that are not currently.

In-stream and Riparian Habitat

The Nisqually Salmon and Steelhead Habitat Limiting Factors report describes salmon stocks in the basin and habitat factors that are limiting to salmon recovery (Kerwin, 1999). The lower Nisqually River (RM 12.7 to RM 19.0) has instream habitat characterized by deep pools and boulder stretches with some gravel patches for spawning. The lower two miles of have more spawning gravel present (Kerwin, 1999). Riparian habitat varies considerably throughout this portion of the river. In areas such as Ohop Creek (Pierce County), instream flow and habitat has been significantly altered due to ditching associated with agricultural activities. Ultimately, this channelization resulted in little to no off-channel rearing with the riparian area being eliminated. Surface and groundwater withdrawals reduce the availability of instream flow, resulted in salmon spawning habitat being extremely susceptible to sediment scour and deposition.

Riparian habitat has been affected within the watershed, affecting steam environment, nutrients, and food web base. All salmonid species need a functional riparian zone in addition to adequate flow, water quality, and habitat. Returning adults prefer pool habitat that has deep pools with riparian cover and woody debris (Kerwin, 1999). In the lower Nisqually River (RM 2.4 to RM 12.7), bank armoring and grading along the railroad has resulted in a reduction in riparian cover. In the upper portion (RM 4.5 to RM 12.7), riparian habitat is largely forested (Kerwin, 1999). Areas around the Nisqually Head and Luhr

Beach have developed some areas of built environment and non-forest vegetation within 100 feet of the shoreline (Thurston County, 2013a).

Within the Nisqually Watershed, there are seven natural populations including the Nisqually Fall Chinook, the Nisqually Winter Steelhead, the Nisqually Winter Chum, Nisqually Coho, Nisqually Coastal Cutthroat, West South Sound Coastal Cutthroat, and Nisqually Pink. The Nisqually Chinook has been federally listed since 1999, and is a mixed stock with 1,834 hatchery-origin escapement and 430 natural-origin escapement in 2011.[40] The Nisqually Winter Steelhead is also a federally listed threatened species (2007) and has seen a decrease in natural spawning from 1,972 in 1980 down to 593 in 2014. However, in 2011, the natural spawning stock was at 297 and has since increased. The remainder of the seven stocks are not warranted under federal status at the time of this report. These stocks are generally reflective of the 1992 Washington State Salmon and Steelhead Inventory (SASSI), which also includes Nisqually Sockeye and Nisqually Bull Trout.

Categories of Habitat Limiting Factors

The major habitat limiting factors that Kerwin (1999) identified for salmonid species are categorized to organize the *Salmon and Steelhead Limiting Factors* report and provide a reasonable structure to assess habitat conditions within the basin. These categories overlap with each other and one habitat problem could impact more than one of the following habitat limiting factor categories.

Loss of Access to Spawning and Rearing Habitat

Artificial structures that restrict access to spawning habitat for adult salmonids or rearing habitat for juveniles includes culverts, tide gates, levees, channel constrictions and dams.

Floodplain Conditions

Impacts include direct loss of aquatic habitat from human activities in floodplains (such as filling), disconnection of main channels floodplains, and impeding the lateral movement of flood flows and the main channel. In a natural state this lateral movement and the floodplains provide storage for floodwaters, sediment, and large woody debris, and contain numerous sloughs, side channels, and other features that provide important habitat.

Streambed Sediment Conditions

[40] For more information on this stock of Nisqually Chinook, visit: https://fortress.wa.gov/dfw/score/score/species/population_details.jsp?stockId=1200

A broad range of impacts are associated with changes in the inputs of fine and coarse sediment to stream channels. This category also assesses instream habitat characteristics that are related to sedimentation and sediment transport.

Riparian Conditions

Impacts to riparian areas include timber harvest, development, clearing for agriculture, and direct access of livestock to stream channels. This category addresses factors that limit the ability of native riparian vegetation to provide shade, nutrients, bank stability, and large woody debris (LWD).

Water Quality

This category addresses water quality factors that directly affect salmonid populations including, stream temperature, dissolved oxygen, and toxics as well as turbidity and in some cases fecal coliform problems.

Water Quantity

Changes in flow conditions can have a variety of effects on salmonid habitat. The availability of summer rearing habitat is decreased by low flows, while increased peak flows can scour or bury spawning habitat. This category addresses changes in flow conditions brought about by water withdrawals, the presence of roads and impervious surfaces, the operation of dams and diversions, alteration of floodplains and wetlands, and changes in vegetation age.

Estuarine and Nearshore Habitat

These areas provide important rearing habitat and opportunity for the transition between fresh and salt water. Impacts include loss of habitat complexity and loss of tidal connectivity from activities and artificial structures such as bulkheads, overwater structures, filling, dredging, and alteration of sediment process. This category includes water quality issues in these areas such as toxics, dissolved oxygen, and water temperatures.

Lake Habitat

Impacts that are unique to the important habitat that lakes can provide are included in this category. Impacts include the construction of docks and piers, increases in aquatic vegetation, the application of herbicides to control plant growth, and changes in lakeshore vegetation.

Biological Processes

There are a variety if impacts included in this category brought about by the introduction of exotic plants and animals, increased predation or competition, and loss of food-web function due to habitat changes as well as the loss of ocean-derived nutrients caused by the reduction in the amount of available salmon carcasses.

Assessment of Habitat Limiting Factors

The *Salmon and Steelhead Habitat Limiting Factors* report (Kerwin, 1999) identified current, known habitat conditions in the Nisqually Watershed. These habitat limiting factors are prioritized by habitat factor. Habitat conditions are rated into three categories: "good", "fair", and "poor" by stream for each (Table 11, pg. 104, Kerwin, 1999) and includes the source for those ratings. These ratings are based on quantitative studies, published reports, and the professional judgement of TAG member. Significant data gaps are also noted. Lack of a particular stream reflects that no information was available, but does not mean a habitat is not necessarily of concern.

Access to spawning and rearing habitats lists two primary barriers in the report: dams and diversions, and impassable culverts. Two hydroelectric projects are located on the Nisqually River. The LaGrande Dam is a defining feature and is the upstream barrier to anadromous fish in the Nisqually River. Alder Dam, upstream of the LaGrande Dam, effectively intercepts all salmon spawning sized gravels and large woody debris from the upper Nisqually River basin (Kerwin, 1999). There are identified impassable culverts to anadromous fish in the Nisqually National Wildlife Refuge, on McAllister and Eaton Creeks and an unnamed tributary near Bald Hills Rd SE.[41]

Recovery Plans

The Nisqually Chinook Work Group prepared the *Nisqually Chinook Stock Management Plan* (2011, draft) is the next step in the process to recover fall Chinook in the Nisqually River Basin. This plan provides a framework for moving past the period of hatchery colonization and into a period of natural fish adaptation. Goals identified in the *Nisqually Chinook Recovery Plan* (Nisqually Chinook Recovery Team, 2001) included the development of a locally adapted natural population of fall Chinook in the basin to take advantage of improvements in habitat defined in the recovery plan. Long term objectives for the Nisqually River Fall Chinook include to assure natural production by providing high quality habitat, assure sustainable harvest opportunities, provide significant contributions, secure and enhance natural production, and assure that the economic, cultural, social and aesthetic benefits derived from the Nisqually ecosystem will be sustained. These goals are separated into long-term conservation goals, long-term harvest goals, short-term harvest goals, and habitat management goals.

[41] A map of all total, partial, and percent fish passage blockages can be viewed on WDFW's Fish Passage Program map: http://wdfw.wa.gov/conservation/habitat/fish_passage/data_maps.html

Many of the major plan elements have been implemented over the last 10 years and model assessments suggest that the fall Chinook potential has increased by 60% since habitat recovery began in 2001 (Nisqually Chinook Work Group, 2011).

The Nisqually Steelhead Recovery Plan (Nisqually River Council, 2015 draft) is a broad and comprehensive approach to recovering steelhead in the Nisqually River watershed. Winter steelhead generally spend 1 to 3 years in freshwater, and rely heavily on stream habitat year round. Steelhead stock has been declining consistently since the 1980's. Recovery goals and objectives are separated into broad long term goals and more specific short term goals to improve future salmon and steelhead populations. Long term watershed goals include (Nisqually River Council, 2015 draft):

Conservation Goals:

- Ensure a thriving and harvestable natural production of winter steelhead by providing high quality functioning habitat.
- Ensure long-term protection of local Nisqually winter steelhead.
- Ensure the economic, cultural, social and aesthetic benefits derived from the Nisqually ecosystem.

Harvest Goals:

- Ensure sustainable harvest of natural-origin winter steelhead.
- Provide for a winter steelhead-directed treaty fishery of approximately 2,500 fish in the Nisqually River.
- Provide for a full season of winter steelhead sport fishery in the Nisqually River.

Short-term foals for steelhead in the Nisqually River watershed are intended to be accomplished within a 5-10 year timeframe to slow population decline, preserve genetics, and improve habitat conditions. Short term watershed goals include (Nisqually River Council, 2015 draft):

Conservation Goals:

- Restore population productivity, abundance, distribution, and diversity to ensure viability of Nisqually winter steelhead.
- Protect, restore, and enhance important habitat values and functions.
- Protect the existing genetic and life history diversity.
- Ensure that local and regional hatchery programs are managed to reduce impacts on wild steelhead.

Harvest Goals:

- Restore population productivity and abundance levels adequate to provide sufficient steelhead and eliminate incidental harvest conflicts.
- Provide for a predictable Nisqually tribal ceremonial and subsistence harvest.

5.4.1 Status of Species Recovery Plans

Much of the five years after the completion of the Nisqually Chinook Recovery Plan has been spent furthering the protection of key habitats for salmon within the Nisqually Watershed and targeting high priority stream reaches. As of 2008, 70% of the Nisqually River that is used by salmon is under protective ownership. Additional projects proposed in the *Nisqually Watershed Chinook Salmon Recovery Plan 3 Year Work Program* (2008) will increase protective ownership of habitat by over 3 miles, increasing the 70% protection up to almost 75%.

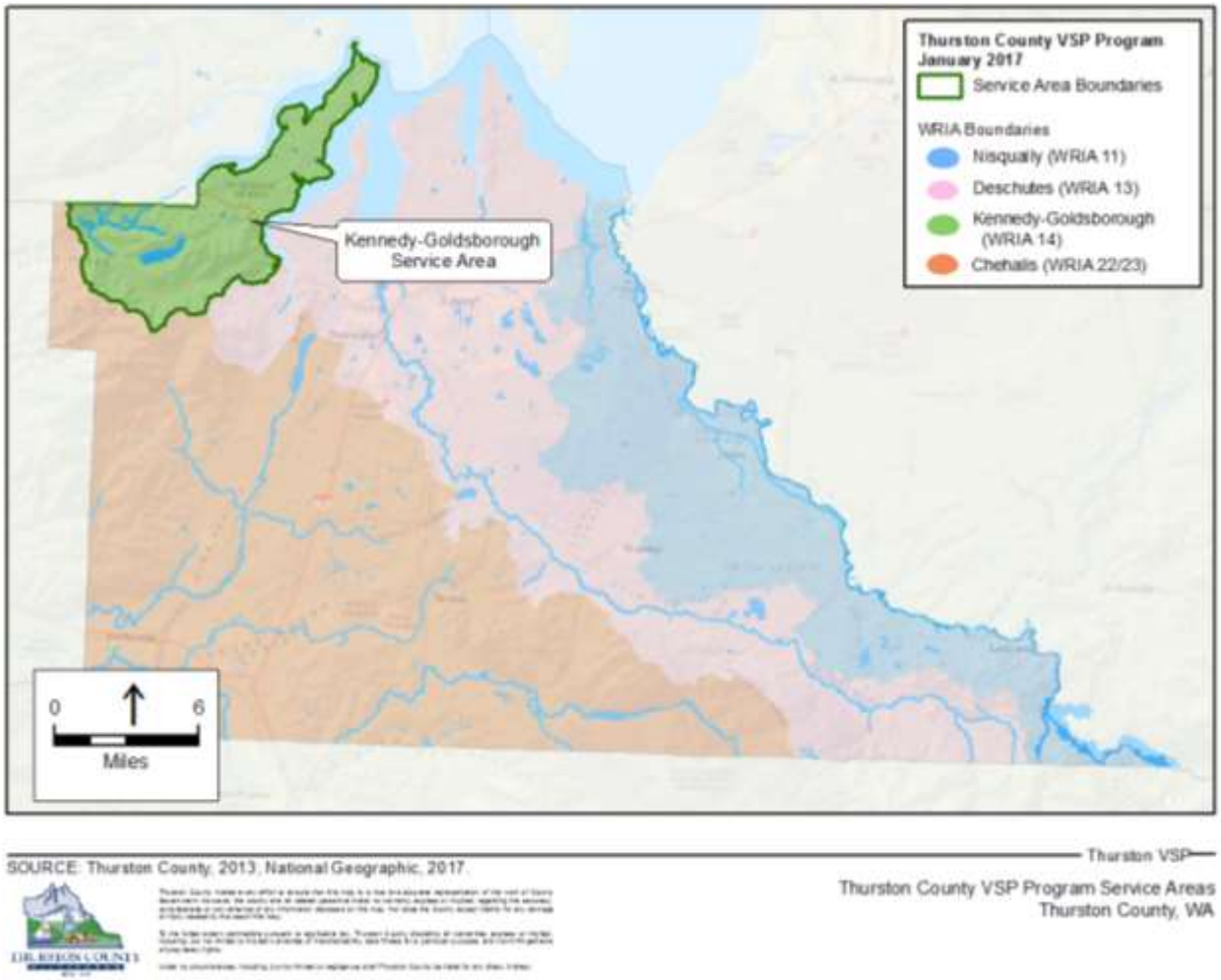
The first two major habitat restoration projects included restoring 100 acres of estuary habitat and 1.5 miles of instream habitat in the Mashel River. Future large-scale restoration projects include the second and third phases of the Ohop Creek restoration and continued habitat protection (Nisqually River Council, 2015 draft). Habitat projects are intended to increase productivity and capacity of the watershed, resulting in an increase in life history and stock diversity from 80% to 93%. Acquisition of anadromous habitat to increase permanent protection includes 5 miles total along the Nisqually, Ohop Creek and Mashel River, 200 acres in the Lower Nisqually and McAllister Creek, and 100 acres along the South Sound shoreline from 2008-2010.

The *Nisqually Watershed Salmon Recovery 3 Year Work Program* (2012) updates that since the implementation of the original Nisqually Chinook Recovery Plan, restoration efforts have continued. Major habitat restoration projects include Ohop Creek phase 1, and several Mashel River wood placement projects. Future projects include Ohop Creek phase 2 and 3. In 2011, the watershed reached the goal of 75% of the Nisqually River mainstem shoreline under protection. Priorities in the 2012-2014 work plan generally reflect the same priorities of the last work plan and include estuary restoration, protection of the Nisqually mainstem, protection and restoration of the Mashel River, protection and restoration of Ohop Creek, and protection and restoration of the Puget Sound nearshore.

6 Kennedy-Goldsborough Watershed Existing Information and Baseline Conditions

The Kennedy-Goldsborough watershed is the smallest within Thurston County and consists of about 15% irrigated agricultural use. Approximately 48 square miles of the total 381 square miles are within Thurston County. There are a total of 6,476 acres of agricultural activities in this watershed: 1,572 acres of agricultural activities are on land, and the remaining 4,904 acres are approved tidal shellfish areas that intersect with a Critical Area. This watershed has the least acreage of agricultural activities mapped of any watershed in Thurston County.

Figure 4: Outline of the Kennedy-Goldsborough Watershed in Thurston County



6.1 Watershed Management Data and Plans

The Plateau Technical Communication Services prepared the WRIA 14 Watershed Management Plan for the Kennedy-Goldsborough Watershed in 2006 as part of the watershed planning process called for by the Watershed Planning Act (ESHB 2514). The lead agency for the watershed planning effort was Mason County. The watershed plan is essential to ensure that abundant, clean water continues to be available for growing communities and fish and wildlife. This watershed management plan includes mostly rural area and the City of Shelton, primarily in Mason County. Approximately 15% of the watershed lies within Thurston County, and less than 1% in Grays Harbor County. This plan involved several local government representatives with a collaborative approach to water resource management. Primary focus of this plan includes current conditions of water quantity (water budget and water rights), water quality, instream flows, and habitat. Recommendations are made for the watershed in monitoring and data analysis, sewage management, storm water management, conservation, habitat, public education and outreach, compliance and enforcement, and future planning. The planning group completed a draft of

the plan in 2006, but was unable to reach consensus. In 2008, Legislature passed a bill (SB 6204) that split WRIA 14 into two separate areas for watershed planning purposes. WRIA 14b – the area that contains the southern portion draining into the lower Hood Canal – was included in WRIA 16's planning group (Ecology, n.d.).

6.1.1 Recommendations and Suggested Actions

Kennedy-Goldsborough Watershed Management Plan

Monitoring and Data Analysis

Current, reliable, long-term data is largely unavailable for the watershed for water quality and quantity. The planning unit recommends that Mason County, Thurston County, and the State of Washington support a comprehensive water-resource monitoring program for the watershed. Primary tasks include:

- Prioritizing sub-basins
- Suggesting a schedule for investigation
- Identifying lead agencies
- Identifying potential funding sources

Sewage Management

- Major sources of pathogens and contamination of the watershed include septic systems, inappropriate land development practices, reduced riparian vegetation, wildlife, livestock and pet waste, and poor storm water controls.
    - Adopt a risk-based management approach to septic systems, where higher-risk areas require a higher level of management.

Storm water Management

- Storm water carries contaminants into the watershed. Fine sediment has been a habitat limiting factor for several streams. Natural infiltration and recharge by maintaining adequate pervious surfaces and vegetative is considered the most effective and economical method to manage storm water.

Conservation

- Many streams in the basin do not meet instream flows and are closed to further withdrawal. WRIA 14 is projected to grow by 30% over the next 10 years, increasing demands by about 1,560 AF/year.
    - Mason and Thurston County's as well as the City of Shelton should coordinate to develop and implement comprehensive water conservation plans for all water users. These plans should be consistent with WAC 246-290-100 and WAC 246-291-140. They should also attempt to maximize conservation in the watershed, considering conservation options such as incentives to retrofit existing homes with

water-saving devices, incentives to leave natural vegetation, measures to identify and correct leakage, and other methods.

Habitat

- For optimum survival, salmonids require adequate stream flows, good quality water, ample gravels relatively free of fine sediment, a functional riparian zone, and structures such as large woody debris, riffles and pools.
    - Ongoing habitat restoration, preservation, and recover activities funded through the Salmon Recovery Funding Board, the National Fish and Wildlife Foundation's Community Salmon Fund, and other sources.
    - Activities include the Lead Entity process, South Sound Salmon Sustainability Initiative, Shared Strategy for Puget Sound, the Puget Sound Conservation and Recovery Plan, the Puget Sound Nearshore Ecosystem Restoration Project, and Co-manager initiatives.

Public Education and Outreach

- Outreach programs should be provided by the local agency or organization best suited to address a particular topic and reach key audiences effectively. Outreach methods could include: volunteer programs, mass media, mailings, presentations, one-on-one assistance, workshops, and outreach at public events.
- Entities such as but not limited to Mason and Thurston Counties, Mason and Thurston Conservation Districts, City of Shelton, Squaxin Island Tribe, WSU Extension, Washington Sea Grant, South Puget Sound Salmon Enhancement Group, and water purveyors should actively seek funding and work to ensure that audiences receive consistent information.

Compliance and Enforcement

- The State, Mason and Thurston Counties and the City of Shelton should give high priority to funding increased compliance and enforcement activities.

Future Planning

- Current boundaries within the watershed are not optimal to address issues. The Planning Unit recommends that Mason and Thurston Counties and the City of Shelton estimate the anticipated demand for water and reconcile discrepancies between water demand and availability.
- Legislature separates WRIA 14 into two WRIAs – 14a and 14b.
- In the future, the State should consider consolidating all areas that drain into Eld Inlet into the same WRIA.
- Mason and Thurston Counties and the City of Shelton coordinate planning under the GMA with water resource planning.

6.1.2 Detailed Implementation Plan Strategies

A Detailed Implementation Plan was completed for WRIA 14b (after its inclusion with WRIA 16, the Skokomish-Dosewallips watershed) in June 2008. Watershed planning stopped in phase 3 for WRIA 14a, the planning phase before adoption. An implementation plan was not developed for WRIA 14a.

6.1.3 Status of Watershed Management Plans

The Kennedy-Goldsborough watershed was separated into two WRIAs, 14a and 14b, for watershed planning purposes after the recommendation was made in the watershed management plan. The Legislature passed a bill (SB 6204) in 2008, splitting the watershed for planning purposes. The portion that drains into the southern portion of the lower Hood Canal (WRIA 14b) was included under WRIA 16's planning and implementation efforts as of June 12, 2008. The Skokomish-Dosewallips / South Shore Lower Hood Canal (WRIA 16 / WRIA 14b) have completed phases 1-3 and are currently in phase 4: implementation.

Only phases 1 and 2 were completed for WRIA 14a. The Planning Unit was unable to reach consensus in adopting the watershed management plan, and therefore the planning effort was terminated. The Planning Unit completed a draft of Phase 2 Level 1 Assessment to identify and detail water issues of the watershed. Watershed planning stopped in phase 3 (planning phase)

6.2 Water Quality Data and Plans

The following information on water quality is primarily from the Department of Ecology's website and publications on the Kennedy-Goldsborough Watershed area. Several tributaries within the Kennedy-Goldsborough watershed often do not meet water quality standards for bacteria, pH, dissolved oxygen, temperature, and nutrients. Studies that have been done on the Kennedy-Goldsborough watershed include a Surface Water Quality Monitoring Strategy (2003), a preliminary assessment of the lower Hood Canal and Streams (2005), a Phase II Hydrogeologic Investigation (2005), a build-out and projected water quantity analysis (2005), and a watershed water storage assessment (2005). The South Puget Sound Dissolved Oxygen Study (2014) covers portions of the south sound that are included in the watershed within the County, such Totten and Eld Inlets.

Water Quality Standards

Washington State Department of Ecology sets water quality criteria to protect beneficial uses (also known as designated uses), including public water supply, protection for fish such as salmonid spawning, rearing, and migration habitat, protection for shellfish and wildlife, as well as recreational, agricultural, industrial, navigational, and aesthetic purposes.[42] The water quality criteria are applied along with the

[42] For more information visit the Department of Ecology's State of Washington website for *Surface Water Quality Standards* http://www.ecy.wa.gov/programs/wq/swqs/index.html

designated uses for every waterbody in the state. For example, Perry Creek and tributaries are used for core summer habitat, primary recreation uses, domestic, industrial, agricultural, and stock water supply uses, wildlife habitat, harvesting, commerce and navigation, boating and aesthetics (Ecology, 2012).

The Kennedy-Goldsborough Watershed – Phase II Level 1 Assessment Draft (Golder Associates, 2002) is a compilation of existing information to provide an overview of water resources of the Basin. The basin was delineated into four sub-basins for the assessment. The Kennedy Sub-basin includes the drainages of Kennedy and Schneider Creeks in the south end of the basin, and includes almost the entire portion of the watershed that extends into Thurston County. This sub-basin also includes the north drainage of Eld Inlet and all of Totten Inlet. Other sub-basins include the Skookum sub-basin, the Goldsborough sub-basin, and the Case sub-basin. The following tables provide water quality parameters and criteria for some waterbodies in the Kennedy-Goldsborough Watershed.

Table 26. Water Quality Standards: Kennedy Creek – beneficial uses include core summer habitat and extraordinary primary contact[43]

Parameter	Condition	Value
Temperature	Highest 7- DADMAX.	16º C.
Dissolved Oxygen	Lowest 1 day minimum.	9.5 mg/L.
Turbidity	Turbidity shall not exceed:	5 NTU over background when background is <= 50 NTU -or- 10% increase in turbidity when background is > 50 NTU.
pH		Range within 6.5 – 8.5, with a human-caused variation within the above range of < 0.2 units.
Bacteria		Fecal coliform organism levels must not exceed a geometric mean value of 50 colonies/100mL, with not more than 10% of all samples (or any single sample when less than 10 sample points exist) obtained for calculating the geometric mean value > 100 colonies/100 mL.

Table 27. Water Quality Standards: Schneider Creek – beneficial uses include core summer salmonid habitat and extraordinary primary contact recreation

Parameter	Condition	Value
Temperature	Highest 7- DADMAX.	16º C.
Dissolved Oxygen	Lowest 1 day minimum.	9.5 mg/L.

[43] This table is adapted from Ecology's Water Quality Atlas
http://www.ecy.wa.gov/programs/wq/303d/currentassessmt.html

Turbidity	Turbidity shall not exceed:	5 NTU over background when background is <= 50 NTU -or- 10% increase in turbidity when background is > 50 NTU.
pH		Range within 6.5 – 8.5, with a human-caused variation within the above range of < 0.2 units.
Bacteria		Fecal coliform organism levels must not exceed a geometric mean value of 50 colonies/100mL, with not more than 10% of all samples (or any single sample when less than 10 sample points exist) obtained for calculating the geometric mean value > 100 colonies/100 mL.

Water Quality Assessment and Impairments

The Federal Clean Water Act requires Washington State to prepare a list of all surface waters in the state that are impaired by pollutants. Washington's Water Quality Assessment (Sections 303(d) and 305(b) integrated report) identifies polluted waters that are documented in the online mapping tool.[44]
The Water Quality Assessment integrated report divides waterbodies into five categories based on the assessment of available and credible water quality data:

- Category 1—Meets tested standards for clean water
- Category 2—Waters of concern
- Category 3—Lack of sufficient data
- Category 4—Polluted waters that do not require a TMDL because the problems are being solved in one of three ways:
    - 4a—Has an approved TMDL and it is being implemented
    - 4b—has a pollution control plan in place that should solve the problem
    - 4c—Is impaired by a non-pollutant such as low water flow, dams, and culverts
- Category 5—Polluted waters that require a TMDL – the 303(d) list

There are water quality problems throughout Thurston County. Fecal coliform is the most widespread pollutant affecting waterbodies in WRIA 14, and pH is considered the second largest reason for water quality impairment in WRIA 14 (Golder & Associates, 2002). The following lists the polluted waters that require a TMDL (the 303(d) list) from the current (2012) EPA-approved assessment for the Kennedy-Goldsborough Watershed within the County:

- Burns Creek – pH
- Pierre Creek – pH, Dissolved Oxygen
- Schneider Creek – Dissolved Oxygen
- Summit Lake – PCB

[44] For Washington's Water Quality Assessment and 303 (d) list visit: http://www.ecy.wa.gov/programs/wq/303d/index.html

- Totten Inlet – Bacteria

Nutrients and Dissolved Oxygen

Nutrient influx into a waterbody (e.g. nitrates and phosphorus) can come from fertilizer, animal waste, or human waste via in-ground septic tanks. An excess of nutrients results in algal blooms and elevated plant life, in turn depleting oxygen. According to the Phase II – Level 1 assessment draft for the Kennedy-Goldsborough watershed (2002), there was only one listing for Dissolved Oxygen in WRIA 14- Case Inlet and Dana Passage. Depletion of oxygen from a waterbody can result in temperature rise, excess organic matter, and increased susceptibility to other environmental stressors.

Temperature

Temperature is a pollutant that can influence organisms, dissolved oxygen, and salmonid rearing habitat. Within WRIA 14, no waterbody has been listed as a category 5 based on the parameter of temperature on the 303(d) list. Water temperature is most commonly an issue in the watershed due to reduced groundwater inflow to streams (especially during summer) and loss of riparian corridor. Some waterbodies are listed as a category 2 for temperature (water of concern), including Burns Creek, Eld Inlet, Oakland Bay, Perry Creek, Squaxin Passage, and Totten Inlet. Rising stream temperature is primarily a concern for the quality of habitat for salmonids, shellfish and forage fish.

Bacteria

Fecal coliform is the most widespread pollutant affecting waterbodies in WRIA 14. This may be derived from agricultural practices (animal waste, feed lots), septic systems, naturally occurring wildlife waste, or domesticated animals (Golder & Associates, 2002). Additionally, treated effluent is discharged into several marine waters, including Harstine Island, Rustlewood, and Carlyon Beach. Waterbodies that require a TMDL for fecal coliform within Thurston County include Burns Creek, Perry Creek, Pierre Creek, Schneider Creek, and Totten Inlet. Fecal coliform is generally used as an indicator to the potential presence of disease-causing organisms (Golder & Associates, 2002).

6.2.1 Status of Water Quality Improvement Projects

Total Maximum Daily Load (TMDL) studies in the Kennedy-Goldsborough watershed are established for bacteria and dissolved oxygen and required for pH and PCB. Eld and Totten Inlets have a Water Quality Improvement Project for fecal coliform. The inlets are located in the southwest Puget Sound, and are characteristic of small farms and residential land uses streamside. Several creeks in the watershed have enough fecal coliform to pose risk of illness to recreational uses (Ecology, 2014). This also has the potential to affect commercial and recreational shellfish harvests in the inlets and associated marine areas. Fecal coliform is primarily from septic systems, livestock, pets and birds. The bacteria is mostly an indicator to other pathogens that may be present and harmful in a waterbody. Cleanup will focus first on controllable, human-related sources.

In April 2006, a technical advisory group (TAG) began to develop a Water Quality Improvement Project (WQIP) for fecal coliform in Totten and Eld Inlet and tributaries affecting these inlets. The WQIP was approved in June 2006 with a final publication in 2007. Main elements of the cleanup strategy include: investigation to find sources of pollution, such as field surveys and water quality sampling; technical assistance to help landowners improve management practices and reduce runoff to creeks; outreach to raise awareness on topics that can help improve water quality, like pasture management, operation and maintenance of septic systems, and riparian vegetation; incentives to help landowners with the cost of improved land management, low-interest loans to replace failing septic systems; and monitoring to evaluate progress (Hempleman, 2007). The intention of the WQIP is to encourage voluntary change in practices that degrade water quality. In the event that voluntary efforts are not successful, enforcement may be used.

Bacteria load reduction targets were established for several creeks and tributaries in WRIA 14, including Kennedy Creek (73%), Schneider Creek (73%), Burns Creek (99%), Pierre Creek (96%), McLane Creek (95%), and others (Hempleman, 2007). Reductions to fecal coliform bacteria in the watershed is generally achieved through employment of Best Management Practices (BMPs) at small livestock farms and addressing failing septic systems.

Monitoring has been completed since the WQIP was published. A fecal coliform bacteria investigation was completed in 2008-2009 for the Upper Kennedy Creek, focusing on conditions found above and below the Ranch House BBQ restaurant and its septic system (Dickes, 2009). This project found that sampling met the freshwater fecal coliform bacteria standard for extraordinary primary contact recreation, with no obvious sources of bacteria during the monitoring project. Recommendations from this study were to continue routine operation and maintenance. Other monitoring studies include the Kennedy Creek Fecal Coliform Bacteria Water Quality Monitoring Study (Dickes, 2008*a*) and the Pierre Creek and Burns Creek Fecal Coliform Bacteria Water Quality Monitoring Study (Dickes, 2008*b*). In general, water quality in Kennedy Creek did not meet the state designated water quality standard for extraordinary primary contact recreation for fecal coliform bacteria. Possible sources identified contributing to fecal coliform bacteria include failing septic systems, inadequate waste management in recreational and high use areas, wild and domestic animals and resuspension from in-stream sediments (Dickes, 2008*a).* Pierre and Burns Creeks also didn't meet the state designated water quality standards for extreaordinary primary contact recreation for fecal coliform bacteria, and violated water quality standards every year of the investigation (Dickes, 2008*b*).

Implementation Activities

The implementation strategy for the Totten and Eld Inlets affected by fecal coliform includes clean-up actions for bacteria that focuses on human-related sources of bacteria, source investigation, technical assistance, informational workshops and other outreach aimed at helping landowners improve septic management, continued response to agricultural water quality complaints, and water quality monitoring (Hempleman, 2007). Specific actions include general outreach including workshops for area residents on relevant water quality issues and land management practices, outreach on water quality issues to youth

through schools and 4H, and articles and advertisements in area newspapers. Agriculture and other land use actions include to develop informational materials and conduct workshops and farm tours focusing on BMPs, farm inventory in the watershed, evaluate status of 1990s BMPs, conservation plans for agricultural operations, provide cost-share for agricultural operations and other land use, and to respond to animal feeding operations or pasture based water quality. On-site septic system efforts include outreach and education on septic system operation and maintenance, and implementing proper repair and replacement. Additional investigation includes late summer high bacteria concentration studies, microbial source tracking study, and source monitoring. Stormwater efforts include WSDOT implementing pollution-prevention measures from the Storm Water Management Plan, and outreach to residents on stormwater BMPs and ditch maintenance. Adaptive management actions include involving entities to continue to meet to coordinate actions and funding (Hempleman, 2007). Specific actions are also made for McLane Creek, Schneider Creek, Kennedy Creek, Perry Creek, Pierre and Burns Creeks, Skookum Creek, Hurley Creek, Eld Inlet, Totten Inlet, and for temperature for Skookum Creek.

The Kennedy Creek Fecal Coliform Bacteria Water Quality Monitoring Study is a result from an action item listed in the Water Quality Implementation Plan for Totten and Eld Inlets (Dickes, 2008*a*). For Pierre and Burns Creeks, watersheds include a mixture of rural residential, agricultural, and forested lands with possible bacterial pollution from livestock, domestic animals, wildlife, and on-site septic systems. Best management practices have been implemented and are continuing to be implemented to improve water quality, and include: rotating livestock between pastures, reduction of livestock numbers during the wet season, and creek fencing (Dickes, 2008*b*).

Since the TMDL study, Thurston County began investigating pollution sources that were identified to contribute to poor water quality. Key sources have been addressed through education and health codes (Hempleman, 2007). Thurston and Mason Conservation Districts continue to evaluate the status of best management practices that were implemented in the 1990s, and help landowners develop conservation plans tailored to each property and landowner's needs. The Washington State University Extension has conducted educational workshops and develop materials to help landowners better protect water quality and repair septic systems (Hempleman, 2007).

6.3 Farmland Protection Data and Plans

The agricultural activities layer for VSP maps 1,572.02 acres of agricultural activities (that intersect with critical areas) in the Kennedy-Goldsborough watershed for the 2011 baseline. The Thurston County Farmland Inventory lists 2,435 acres of farmland for the Kennedy-Goldsborough Watershed (Fisher and Mitchell, 2009). Timber production in the watershed has remained the dominant industry, but oyster production is a valuable local commodity (City of Shelton, 2013). Increase in residential development and conversion of forestland to agricultural has altered the natural flow regime, affecting oyster farming and salmon migration within the basin.

County-wide policies, including the Thurston County Comprehensive Plan and the Working Lands Strategic Plan apply to the Kennedy-Goldsborough watershed similarly as to in other watersheds. The Kennedy-Goldsborough Watershed Management plan does not directly address protection of farmland.

6.3.1 Status of Farmland Protection Programs

Most of the Long Term Agriculture (LTA) is in isolated pockets throughout the southern portion of the County. There are no areas of Long Term Agriculture within the Kennedy-Goldsborough watershed that is located within the County. Most of the agriculture within this watershed occurs in Rural Residential Resource 1 unit per 5 acres. This zoning allows some agricultural activities and accessory agriculture, but does not allow all agricultural accessories. These areas are susceptible to being developed in the future.

Properties can be enrolled in the Open Space Tax Program and are valued at their current land use rather than their "highest and best" use. Landowners who voluntarily commit to continuing agricultural uses may apply for current use classification, which results in significant property tax savings and helps reduce pressures to convert farmland. In the Kennedy-Goldsborough Watershed as of 2016, 407 acres are designated current use Open Space Agriculture in the Assessor's Program. Additionally, 122 acres are designated as farm and agriculture conservation land in the Commissioner's program. In total, there are 529 acres of farmland protected through open-space tax programs in the Kennedy-Goldsborough Watershed. In 2011, there were 468 acres enrolled in the Assessor's Open Space Program and 97 acres enrolled in the Commissioner's Open Space Program (565 acres total). Since 2012, the Thurston Conservation District has continued to work with farmers to develop farm plans, nutrient management plans, and Conservation Reserve Enhancement Program (CERP) Plans. In the Eld / Totten Inlet (primarily in the Kennedy-Goldsborough Watershed, but also overlapping into the Deschutes Watershed) between 2012 and 2016, five conservation plans were developed.[45]

In total, the Capitol Land Trust and partners have conserved more than 1050 acres across 14 sites around Eld and Totten Inlets, some natural and some agricultural. Agricultural properties include the 530-acre Wynne Tree Farm that protects most of the upper Schneider Creek Valley, the 30-acre Appleby Conservation Easement that contains 15 acres of hay producing agricultural lands, 203 acres of the Triple Creek Farm Conservation, and 54 acres of the Willits Tree Farm. Currently conserved lands in the Kennedy-Goldsborough watershed include Wynne Tree Farm Conservation Easements.

6.4 Species Recovery Data and Plans

Terrestrial Habitat

Within the Kennedy-Goldsborough watershed in Thurston County is some of the best condition habitat in Thurston County, located in the Black Hills just south of Highway 101. Steamboat Island peninsula

[45] Thurston Conservation District Personnel, *personal communication*, May 25, 2016.

contains a mosaic of habitat conditions ranging from medium to low quality. Areas of lowest quality habitat occur along Mud Bay, Madrona Beach, Highway 101, Highway 8, and at the western tip of the peninsula where there is higher development. The watershed contains habitat areas for many species including riffle sculpin, mountain quail, tailed frog, osprey, bald eagle, and wood duck. Mapped priority habitat species areas include just south of Highway 8 and Mountain Road SW, between Highway 101 and Whittaker Road NW, in Young Cove and Frye Cove, south of Steamboat Island Road NW and north of Stetson Court NW, and at the end of 85th avenue NW on the western side of the peninsula. There are three public parks and preserves mapped within the watershed, including Kennedy Creek Natural Area in the western base of the Steamboat Island Peninsula, Louise Meyers Park near Steamboat Island Road NW and 54th Ave NW / Calvert Rd, and Frye Cove Park just north of Frye Cove (Thurston County, 2013).

The habitats and species of concern in the Kennedy-Goldsborough watershed are primarily breeding areas for wood duck, emergent wetlands, and estuarine zone in Young Cove, and a small area of shorebird and waterfowl concentrations near the Kennedy Creek Natural Area Preserve. There is limited prairie in the Kennedy-Goldsborough watershed. Continuity of habitat is a concern across the watershed, and can influence habitat quality for both fish and wildlife (Plateau Technical Communication Services, 2007). The Kennedy-Goldsborough watershed includes diverse floodplain forests, marshes, tideflats, grasslands, pastures and meadows. Riparian zones serve as the interface between aquatic and terrestrial environments (Kuttel, 2002).

In-stream and Riparian Habitat

In-stream habitat and riparian habitat is affected by water quantity within the watershed. Pumping from WRIA 14's aquifer influences the streamflow and the quality of fish habitat. Water quality problems that create unfavorable habitat for salmonids also includes excessive sediment, which occurs from erosion along roads and streambanks and is carried in storm water runoff (Plateau Technical Communication Services, 2007). Generally, instream flows in many reaches of the Kennedy-Goldsborough watershed are below state standards in the late summer months. Several streams within the watershed are closed to further appropriations, including Perry Creek from May 1 to October 31 (Kuttel, 2002, p. 25). Diking, channelization of rivers, conversion of riparian areas to pasture and cropland, loss of beavers, and floodplain development has contributed to the destruction of off-channel habitat (Kuttel, 2002).

The Salmonid Habitat Limiting Factors for the Kennedy-Goldsborough Basin (Kuttel, 2002) describes salmon stocks in the basin and habitat factors that are limiting to salmon recovery. The two primary species of salmon that are supported by WRIA 14's streams include Chum (fall and summer) and Coho salmon, as well as winter steelhead and coastal cutthroat (Plateau Technical Communication Services, 2007). There are no WDFW hatcheries with fish programs listed for this watershed (WDFW, 2011).

Winter steelhead production are affected by low stream flows, which reduce rearing habitat (Kuttel, 2002). Kennedy Creek is considered one of the most productive Chum salmon production (fall-run) streams in Washington State, with escapements averaging 41,000 spawners from 1992-2001 (WDFW, 2016). Mud flats of the inlets in the Kennedy-Goldsborough watershed provide a rich area for

anadromous fish and shellfish (Kuttel, 2002). Instream habitat that is composed of large rocks, large woody debris, and vegetation is important for salmonids, especially Coho salmon because production is limited by the number of suitable territories (Kuttel, 2002). Large Woody Debris is one important component of instream habitat, and is generally lacking in County Line Creek, marginal in Rock Creek and lacking in Goldsborough Creek and tributaries (Kuttel, 2002).

Projects to improve instream quality within the Kennedy-Goldsborough Watershed continue. Mason Conservation District submitted a letter of intent for a large woody debris and riparian enhancement at Gosnell Creek to improve habitat complexity and promote a more natural channel pattern (Mason Conservation District, 2016). Other projects include habitat conservation of strategic parcels in nearshore and freshwater salmon habitat and removal of a bulkhead on Madrona Beach.

Categories of Habitat Limiting Factors

The major habitat limiting factors that Kuttel (2002) identified for salmonid species are categorized to organize the *Salmonid Habitat Limiting Factors* report and provide a reasonable structure to assess habitat conditions within the basin. These categories overlap with each other and one habitat problem could impact more than one of the following habitat limiting factor categories.

Fish Passage

Artificial structures, including dams and culverts, can block salmonid migration up and down streams. The negative effect may be limited to a portion of one generation, or in extreme cases could cause extirpation of an entire fish run.

Riparian Buffers

Riparian zones are the interface between aquatic and terrestrial habitats. These areas contribute stabilization to the streambank, shade to maintain cooler temperatures, and leaf litter to provide production to the aquatic community.

Streambank Condition

Natural streambank stability maintains the integrity of the riverine process. Vegetation can have a difficult time recovering from flood damages or other disturbances if it is continually undermined by a failing bank. Stable streambanks ensure adequate channel depth.

Floodplain Connectivity

Floodplains provide an area for dissipation of energy in floodwaters. Confining streamflow through channelization, and diking increases stream energy by negating the benefits of water dispersing onto the floodplain. This can lead to over-widening and loss of spawning gravels.

Width/Depth Ratio

The width/depth ratio determines if the channel is wide and shallow or narrow and deep. A narrow deep channel is generally more favorably to salmonids than a wide shallow channel because it provides hiding cover and maintains cooler water temperatures.

Substrate Embeddedness

Substrate embeddedness is the product of fine sediment washed into streams. Eroding streambanks, forestland, roads, and urban developments all contribute to fine sediment inputs to streams in the Kennedy-Goldsborough Basin. Ideal salmonid habitat has very little substrate embeddedness. Increased sediment hardens the bottom of steams and makes it more difficult for female salmonids to make redds.

Large Woody Debris

Large trees that fall into streams, or are carried by landslide of floods, stabilize streambeds and collect spawning gravels. In the past, large woody debris was removed to aid navigation, transport logs downstream, speed floodwater release, or remove barriers to salmonid migration. Large woody debris is lacking in many streams because of this, and recruitment is a long-term process that first requires a functioning riparian zone.

Pool Frequency

Pools are important habitat for salmonids and their prey. Pools are used for resting, rearing, hiding cover, feedings and spawning.

Pool Quality

Important features of pools are size, depth, and cover (instream and overhead). Quality generally increases with greater size, depth and cover.

Off-Channel Habitat

Beaver ponds, wetlands, oxbow ponds, and side channels that are connected to the main channel provide off-channel habitat for juvenile salmonids. Off channel habitat provides protection from predators, abundance of food, and refuge in times of high flows. Diking, channelization, conversion of riparian areas to pasture and cropland, floodplain development, and beaver extermination all play a role in the destruction of off-channel habitat.

Water Quality

Salmonids require cold and clean water for survival. Temperature, dissolved oxygen, total suspended solids, H, and other variables influence water quality.

Water Quantity/Dewatering

Streams in WRIA 14 are rainfall dominated, receiving limited snow pack due to the elevation. Summer months bring naturally low stream flows that are further reduced by groundwater withdrawals. Low summer flows limit salmonid rearing habitat throughout the watershed, can hinder migration and can make fish more vulnerable to predation.

Change in Flow Regime

Change in flow regime refers to the current flow conditions affected by human management versus natural flow conditions. Sometimes it is not possible to determine the magnitude of the flow regime change because historic stream flow data is sparse of non-existent. Extensive logging and construction of impervious surfaces likely altered the natural flow regime.

Biological Processes

Biological processes include the presence of introduced plant or animal species that may have a negative effect on salmonids (i.e. reed canary grass, brook trout), as well as the absence of native species that were historically present. Introduced fish may out-compete, hybridize with, or eat native salmonids. Removal of native species can disrupt the ecosystem. One example within the watershed is beavers. Beavers construct ponds that provide excellent salmonid rearing habitat; however, beavers may be trapped or their dams destroyed because people often find them a nuisance.

Estuary/Nearshore

Estuaries are crucial for acclimation of juvenile and adult anadromous salmonids when making the transition from freshwater to saltwater. Within the watershed, marine shorelines are often developed, which negatively impacts the shoreline habitat function. Riparian vegetation is often cleared, lessening the stabilization of the bank and decreasing shade. Thurston County's shoreline is among the most

extensively armored in the Puget Sound. In 1993, about 30% of the 117 miles of shoreline were armored. Currently, more than 50% of parcels along the shoreline are reported as armored (WDFW, 2014).

Assessment of Habitat Limiting Factors

The *Salmonid Habitat Limiting Factors for Water Resource Inventory Area 14* (Kuttel, 2002) identifies current, known habitat conditions within the Kennedy-Goldsborough watershed. Habitat limiting factors are prioritized by habitat factor. Habitat is rated as good, fair or poor for the entirety of the watershed based on salmonid habitat rating criteria (Table 6, pg. 105, Kuttel, 2002).

High density residential development occupies only 1.1% of the basin, primarily in Shelton. Road density in the watershed is 4.6 miles per square mile. Large woody debris is generally considered lacking throughout the watershed as a result of heavy logging in the 19th century. Woody debris removal was commonplace in the state before it was recognized as an important role to maintaining fish habitat. Riparian vegetation in the watershed is dominated by second and third growth trees. These trees do provide large woody debris but are not as large as the coniferous forests that historically dominated the region. Thick vegetative cover limits soil erosion in most areas within the watershed. Streambank erosion is the main contributor to fine sediment in WRIA 14 streams (Kuttel, 2002).

In the Eld Inlet subbasin, Perry Creek receives a poor rating for fish passage, floodplain connectivity, and large woody debris key pieces; a fair or good to poor rating for riparian canopy closure, streambank condition, large woody debris total, pool frequency, and pool quantity; change in flow regime is rated fair; substrate embeddedness and biological processes receives a good rating. Eld Inlet tributaries receive a fair to poor for fish passage, and a poor rating on substrate embeddedness; the remaining habitat limiting factors are data gaps. Summaries are also made for Totten / Little Skookum Inlet, Oakland Bay, and Case Inlet.[46]

Recovery Plans

The Mason Conservation District worked as the lead entity to prepare the *Salmon Habitat Protection and Restoration Plan for Water Resource Inventory Area 14, Kennedy-Goldsborough* (2004). This plan is a comprehensive approach to developing habitat project lists that lead to restoring and protecting salmon habitat through voluntary projects. The plan is divided into: vision for salmon habitat protection and restoration, salmonid profile and strategies, annual high priority approach, subbasin/nearshore assessment and high priority projects and programs, community issues and concerns, guiding principles

[46] For the full table of all streams in the watershed, visit Kuttel, 2002, page 110-112. http://www.pugetsoundnearshore.org/supporting_documents/wria14_lfa.pdf

for program development, evaluation and ranking criteria, and the salmon recovery funding board evaluation and ranking process.

This plan envisions natural watershed processes in freshwater and marine environments of WRIA 14 that preserve or enhance biologically diverse runs of salmon capable of self-sustaining natural reproduction (Mason Conservation District, 2004). Ideally, the community will support these efforts through land-use and development choices. General approaches in the plan include to install fish passage structures, replace failed culverts, improve land use regulation and enforcement, remove setback dikes and riprap, place large woody debris in spawning and rearing areas, increase summer instream flows, and allow beaver populations to rebuild (Mason Conservation District, 2004).

The *Chinook and Bull Trout Recovery Approach for the South Puget Sound Nearshore* (draft, 2005) establishes a strategy for protecting and restoring nearshore habitat that is essential to juvenile habitat. General restoration recommendations for improving nearshore conditions are separated into categories by stressors: shoreline armoring, overwater structures, ramps, stormwater and wastewater, landfill below the HHWL, riparian Loss, wetland and estuarine modification, input of toxic components, predation, boat traffic, invasive species, and shellfish aquaculture.

6.4.1 Status of Species Recovery Plans

The *Salmon Habitat Protection and Restoration Plan for Water Resource Inventory Area 14, Kennedy-Goldsborough* (Mason Conservation District, 2004) rates salmon stocks using the Salmon and Steelhead Inventory (SaSI) rating system. Totten Inlet Fall Chum have had strong escapements since the mid-1980's and are considered "healthy" in 2002, with 85,272 spawners in 1994 and 73,427 spawners in 1998. Skookum Inlet Fall Chum, Upper Skookum Creek Fall Chum, Hammersley Inlet Summer Chum, Johns/Mill Creek Fall Chum, and Case Inlet Summer and Fall Chum are also "healthy". Goldsborough/Shelton Creek Fall Chum is "depressed" because of a profile in escapement and a short term decline in 1997, 1999, and 2000. Deep South Sound Coho are considered healthy in 2002, but was at risk for a "depressed" rating if an upward trend didn't occur thereafter.

A three year work plan was produced by the Hood Canal Coordinating Council that includes nearshore projects for four water resource inventory areas that drain into the Hood Canal, including WRIA 14 (Rosenkotter *et al*, 2007). The *2012 Three Year Work Program Update Narrative to South Sound Watersheds* (2012) identifies actions that have been taken throughout the South Sound as part of salmon recovery. Some of the actions include a nearshore project selection tool for WRIA 13 and 14, work with the BNSF railroad to develop projects and landowner relations, removal of derelict over water pier and creosote pilings and a bulkhead on Squaxin Island, continuing to seek funding for Oakland Bay

Estuary Conservation acquisition and restoration, and working continually in the Goldsborough creek basin to restore fish passage and enhance habitat.[47]

The Squaxin Island Tribe's 5 year review in Chinook recovery indicates a continued decline in forestland cover, riparian conditions, water quality, water quantity, and marine shoreline habitat (Squaxin Island Tribe, 2012). Most impacts are habitat driven by South Sound population growth. It is not expected that the 3-year work plan objectives or 10-year recovery goals will be met, mainly due to lack of funding. Short term objectives are to: achieve "approved" harvest status for 1,733 acres of South Sound shellfish growing areas currently classified as conditional, and to have sufficient returning adult salmonids to provide for escapement quotas, recreational and non-Indian commercial harvest (Squaxin Island Tribe, 2012).

7 Priority Resource Concerns

These are priorities identified by watershed management plans, TMDLs, or other plans. These priorities are not intended to be in a specific order or one given more weight than another. In order to assign preference of one priority over another, a technical team would need to be involved.

Projects that should be prioritized include those that:

- Protect or enhance riparian corridors.
- Stabilize stream banks.
- Protect or restore native vegetation cover.
- Restore properly functioning hydrology.
- Restore floodplain and stream channel function.
- Implement BMPs that reduce or eliminate pollution from agricultural land uses.
- Improve efficiency of water use.
- Restore or enhance wildlife habitat, particularly habitats of concern (i.e., prairie, salmon rearing and spawning habitat, oaks and grasses).
- Maintain or improve the viability of agriculture. Protect or enhance agricultural lands that are in use, especially lands that are at a higher risk of development.
- Mitigate peak flows and associated impacts caused by high stormwater runoff volume.
- Reduce sediment input to streams and rivers and associated impacts.
- Protect or enhance channel complexity, including large woody debris.

[47] A full list of actions in the three year work plan update can be viewed on Puget Sound Partnership's webpage: http://www.psp.wa.gov/downloads/SALMON_RECOVERY/2012_updates/South%20Sound%202012%203%20year%20work%20plan.pdf