Section 2
Facilities, Operations, and Needs

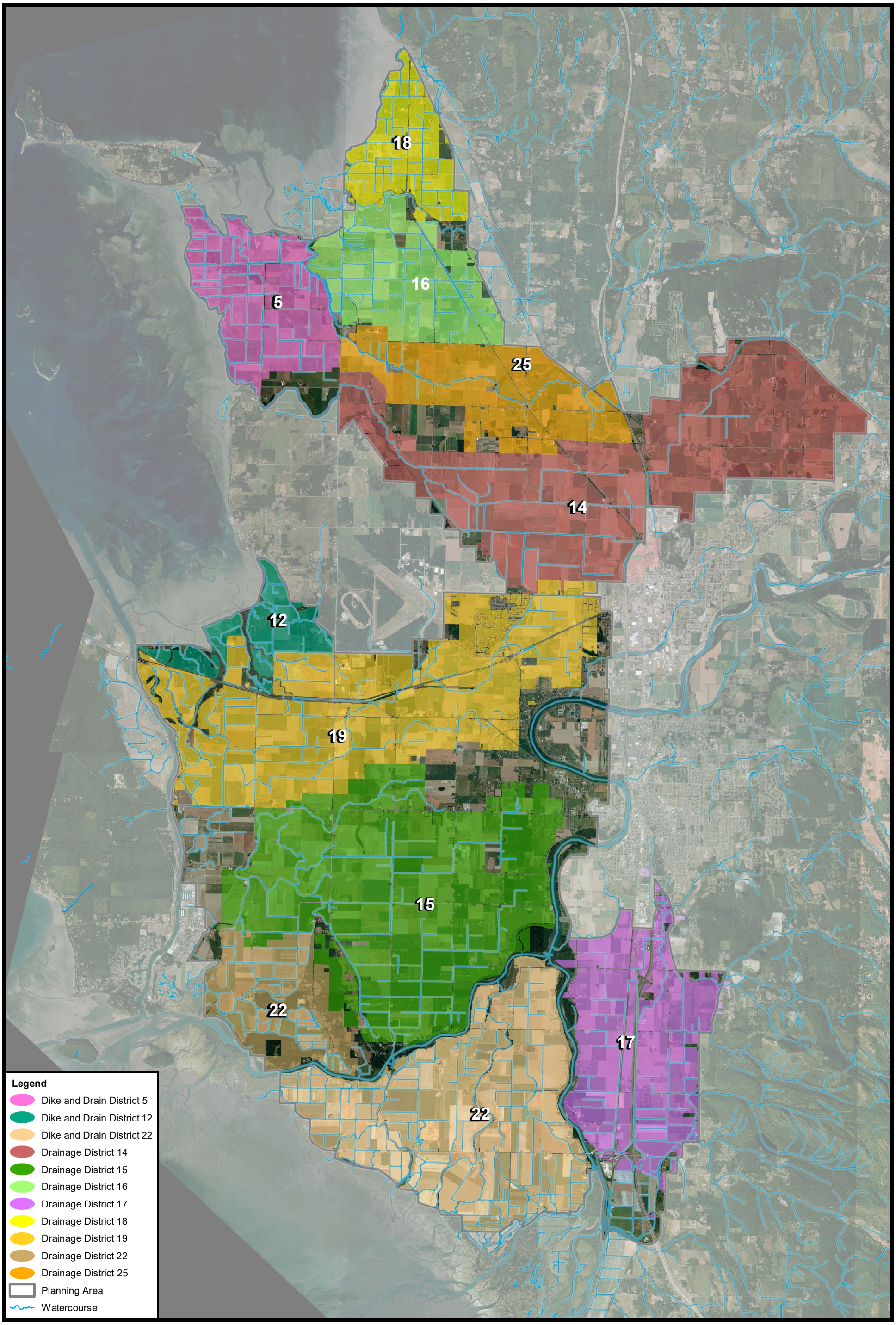
2.1 District History and Organization

The Western Washington Agricultural Association (WWAA) is comprised of agricultural landowners who represent the agricultural community throughout western Washington, and a large membership in Skagit County. The mission of WWAA is to preserve economically viable agriculture in Skagit County and throughout western Washington. For the purpose of this CIDMP, the legal boundaries of 11 drainage districts represented by WWAA were used to define the Planning Area. Each of these drainage districts has recently been established as an irrigation district. The facilities, operations, and needs associated with the parcels served by those districts are described and considered for coverage under this CIDMP (see Section 1.2 and Exhibit 1-1). The districts are described in Exhibit 2-1 and Table 2-1.

Agricultural land was developed in the Skagit Basin by construction of dikes in the mid- to late 1800s. Water was constrained by the dikes, and lands were cleared, drained, leached, and farmed. Individual farmers found it difficult to prevent and control flooding and associated salinization, and farmers thus began to work cooperatively to address the problem in the 1880s. In the 1890s, it became apparent that a local entity was needed to facilitate tax collection from property owners for construction and maintenance of ditches and dikes. In 1895, the State Legislature passed laws which legally sanctioned the organization and funding via taxation of diking and drainage districts. Diking and drainage districts are authorized under Title 85 RCW. New technology allowed farmers to construct an intricate system of drainage ditches and tide gates to maximize the potential for agricultural production in the Skagit Basin. These drainage systems required adequate outlets, and the drainage districts worked to provide and maintain these ditches and outlets.

Over the years, irrigation has become increasingly common in the region due to changing crop patterns and associated water needs (see Section 2.4). Simultaneously, water resource issues have become increasingly contentious in the Skagit Basin and throughout the state. In an effort to effectively address these issues, the 11 drainage districts within the Planning Area (see Table 2-1) reorganized into drainage and irrigation districts in 2004, and chose to participate in this CIDMP process. Irrigation districts are authorized under Title 87 RCW to hold water rights, operate and maintain irrigation facilities and activities, and manage water use and distribution throughout the district as deemed appropriate by the district commissioners.

Individual districts manage the activities within their boundaries and are required to serve all parcels 40 acres and larger. The landowners served by the district pay taxes to the district to fund drainage maintenance and construction activities. Owners of parcels smaller than 40 acres also benefit from district facilities, and most pay district taxes for services provided by the districts. For the purposes of this CIDMP, parcels smaller than 40 acres are included in the Planning Area. District commissioners are elected by property owners within each district and provide leadership and oversight of district activities. WWAA assists the districts in coordinating district activities and collaborating with local government, regulatory agencies, and other entities.



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October 2006

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Exhibit 2-1
Legal Boundaries of Districts In Planning Area

Skagit Basin CIDMP
Western Washington Agricultural Association

Table 2-1. Summary Description of Drainage/Irrigation Districts in the Planning Area

District	Total Acres	Number of Parcels	Miles of Watercourses[1]	Taxes Collected (2003)
5	2,922	136	30.79	$28,000
12 (formerly 8)	606	30	14.23	$0
14	9,264	793	29.50	$80,000
15	9,877	860	51.68	$150,000
16	2,846	191	24.34	$37,000
17	4,604	722	32.65	$50,000
18	1,759	155	17.53	$30,000
19	8,540	1,655	52.59	$100,000
22 (Drainage and Irrigation)	2,294	153	20.85	$30,000
22 (Dike and Drainage)	7,036	499	83.21	$175,000
25	3,568	365	8.76	$6,360
Total	53,322	5,559	366.13	$686,360

Source: Skagit County Assessor's Office, 2005
[1]Watercourses may include natural, managed or altered, and artificial watercourses (see Section 1.2.2).

2.2 Drainage and Irrigation Related Facilities, Operations, and Maintenance

2.2.1 Drainage Facilities and Operation

A complex network of drainage infrastructure has been developed in the Skagit Basin to drain water off the land to make the land farmable. This drainage system is necessary since a significant portion of the area is sub-tidal or subject to tidal influence, and the area receives a lot of rain and the water table is high. In many areas, the drainage system is shallow and drains only the top few feet of land, and does not function as deep drainage and therefore does not affect the underlying aquifer beyond a few feet. The drainage system works to move water off the land in the late fall, winter, and early spring months. The locations of drainage related facilities are shown in Exhibit 2-2. Exhibits 2-3, 2-4, and 2-5 show examples of drainage facilities.

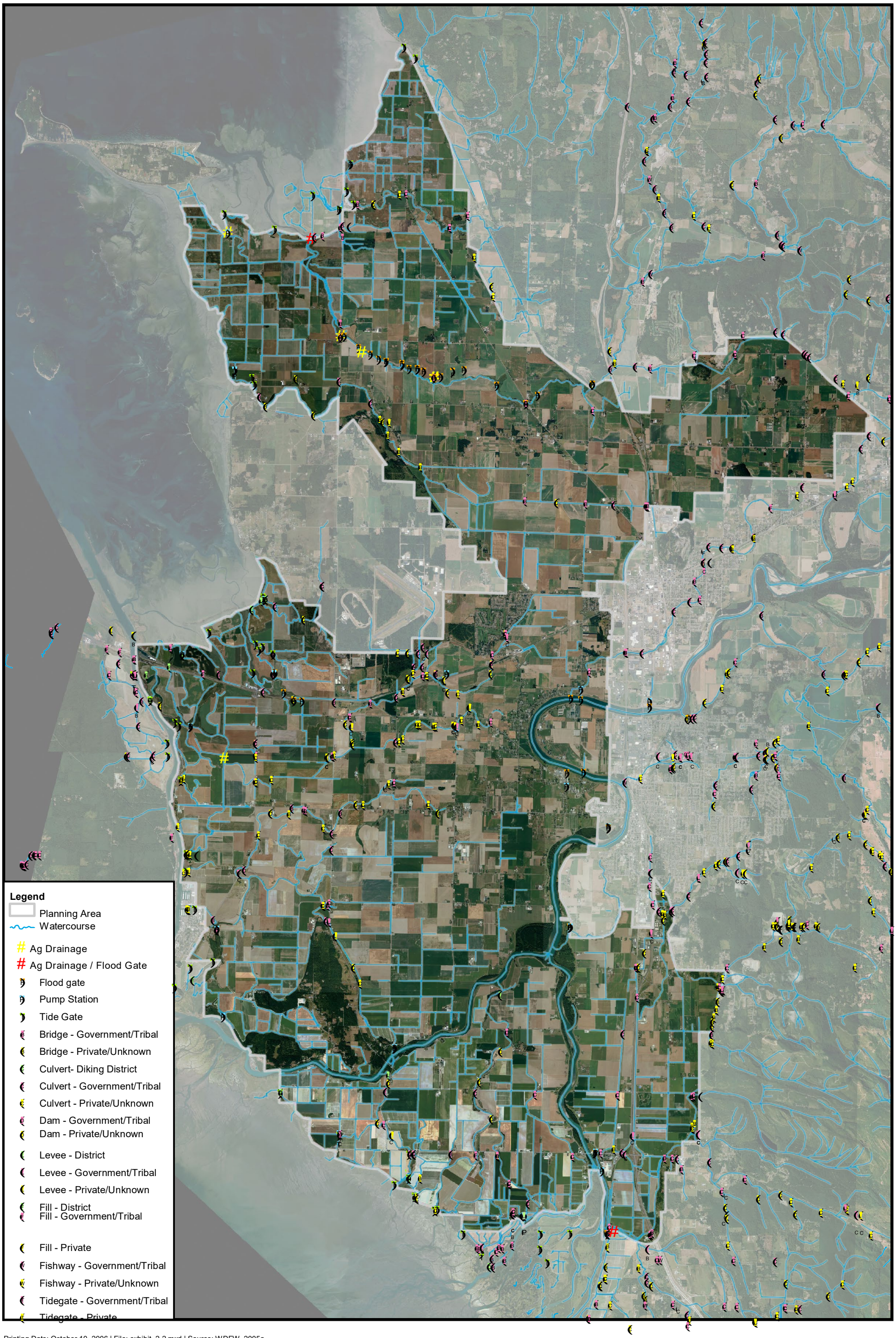

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Exhibit 2-2
Drainage Related Facilities In Planning Area

October 2006

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Skagit Basin CIDMP
Western Washington Agricultural Association

Exhibit 2-3. Trash Rack on Big Indian Slough

Exhibit 2-4. Tide Gates and Activated Pump

The drainage system in the Planning Area is comprised of the following components:

- Water drains from fields into **watercourses**, which may include managed and artificial watercourses. There are approximately 366 miles of watercourses located throughout the Planning Area. All watercourses in the Planning Area ultimately drain to marine waters: to Skagit, Samish, or Padilla Bays.
- **Trash racks** are systems designed to prevent foreign material from entering into a pump facility or tide gate. Such debris may prevent those structures from functioning properly. Typical design is a constructed lumber unit with vertically spaced 2-inch dimensional boards spaced approximately 3 to 5 inches apart. Trash racks are usually set in the water at an incline down to or near the bottom of the drainage ditch. The incline allows for cleaning debris by raking it to the top and removing the debris from the ditch.
- A series of **tide gates** provide an outlet for the water collected in the drainage system, while preventing saltwater intrusion into soil and ditches. A traditional tide gate consists of a flap mounted on the end of a culvert that is incorporated into a dike. The tide gate works as a one-way check valve to keep salt water from entering the agricultural drainage system. When the water level outside the dike, or the tide, is higher than the water level inside the dike, pressure closes the tide gate, preventing salt water from entering the drainage system. The tide gate opens when the tide recedes to a level lower than the water level inside the dike, allowing water to drain from agricultural land into the receiving water. The tide gates provide for passage of water that drains from the fields to the drainage ditches during storm events. The ditches provide storage of water between tidal cycles.
- A system of **flood gates**, or one-way check valves, protects fields from flooding by allowing accumulated water to flow from a field into a drainage system during and after a high water event.
- Several **pump facilities** are used to maintain water levels in the drainage system during periods of high runoff or high tide. Pumps are typically set to activate depending upon the water level in the ditch. Pump facilities on fish-bearing water courses must either be screened or utilize a “fish friendly” pump to prevent harm to fish.

- Many farmers utilize seasonal **"V-ditches"** which are used to aid in drainage of surface water during the winter and early spring. These are simply constructed, temporary furrows in the fields used to transport water to watercourses. V-ditching is a crucial agricultural practice in the Skagit Basin. They are necessary to facilitate earlier spring plantings, since they help dry the fields earlier in the season. They are also necessary to prevent late fall, over-winter, and perennial crops from being destroyed by heavy rainfall. In most cases, if excess water is not removed from the fields within as little as 24 hours, these crops are lost. Much of the water drained by V-ditches is near-surface groundwater, not surface water. In some locations, the V-ditches carry the water to a catch basin in the center of the field, where it is then conveyed via a pipe to the drainage ditch.
- A series of **check dams** are routinely utilized in drainage ditches to retain available surface water and maintain available groundwater levels for subsurface irrigation, and to prevent saltwater intrusion in lower reaches of the delta.

Exhibit 2-5. Tide Gates and Bridge on Edison Slough

- **Drainage tiles** are often used in fields to collect and transport the water to the main ditch system. Ditch flows are very low and some may be essentially dry in summer months. Many farmers have installed drain tile systems to improve the hydraulic transfer of excess water throughout the system.
- **Culverts** are used throughout the drainage system to transport water beneath roads and bridges, through tide gate dikes, and to connect watercourses.
- **Bridges** span the watercourse for vehicular transport and provide farm equipment access to fields. In locations where drainage infrastructure is coupled with bridges, the bridge can provide access for maintenance.

2.2.2 Irrigation Facilities and Operation

The irrigation facilities utilized in the Skagit Basin are relatively simple in construction and design. Individual wells and surface water diversions are utilized as water sources, depending on the source identified in the associated water right. Approximately 75 percent

of existing recorded water rights in the Planning Area identify groundwater as the water source; 25 percent identify surface water sources (see Section 2.4.2). Irrigation timing varies by crop, but generally occurs in the late spring and summer months.

In addition to these sources, irrigators may occasionally also purchase water, when necessary, from Public Utility District #1 of Skagit County (PUD). The PUD is authorized under Chapter 54.16 RCW to provide water for the purpose of irrigation. This source has become a supplemental water source for irrigators in recent years, although the ability of farmers to utilize this source is limited by the PUD service area. In 2005, an estimated 104,938,416 gallons (322 acre-feet) were purchased by 58 irrigation customers at a cost of $245,856.40. This amounts to a unit cost of approximately $764 per acre-foot of water purchased from the PUD.

Irrigators may also utilize the drainage ditch system for water conveyance or as a district water source for irrigation. In some cases, backflow or tailwater from one irrigator's activities may enter the drainage system and be reused by another irrigator. This practice is sometimes intentionally arranged by neighboring irrigators and is deemed a practical, efficient use of available water.

The following components are utilized for irrigation in the Planning Area:

- The surface water **diversion intake** is a permanent or seasonally placed structure where water is diverted from a river, creek, or other surface water source. The diversion is accomplished by either siting the intake at a location so water flows into it using gravity, or by pumping water into the intake directly from the water body. Surface water diversions from fish-bearing watercourses must be screened to prevent fish from entering the irrigation system.
- **Wells** are used to withdraw groundwater for irrigation use.
- **Pumps** and **pipes** are used to transport water from wells and surface water diversion points to irrigation equipment.
- Farmers utilize **water storage** via check dams and tide gates to retain available surface water and maintain available groundwater levels for subsurface irrigation.
- A variety of **irrigation application equipment** may be used, including big guns, sprinklers, and drip irrigation equipment.

2.2.3 Maintenance of Drainage and Irrigation Facilities

Regular maintenance of drainage and irrigation facilities is necessary to keep the facilities operating effectively and efficiently. Maintenance of irrigation facilities and equipment is currently conducted by individual landowners. Maintenance generally consists of occasional, routine repair of irrigation equipment and other machinery.

Maintenance of drainage system facilities is performed by the districts and generally involves two types of activities: removal of nuisance vegetation that grows in watercourses, and repair or replacement of equipment such as pumps and tide gates. The districts hire licensed contractors to provide maintenance of drainage facilities throughout the districts. Certain types of drainage facilities, such as temporary V-ditches and check dams, are maintained by individual landowners.

Removing vegetation from drainage ditches is essential to the operation of the drainage system. An approved aquatic herbicide is used sparingly to minimize vegetation growth in the ditches, thereby limiting the amount of maintenance required. Herbicides are applied by licensed operators. Sediment and vegetation accumulate in the ditches and impede the flow of water through the system, and must be removed periodically to ensure proper function. This is accomplished from the ditch bank by using a tractor excavator with a bucket attachment. Care is taken to minimize disturbance of the ditch bank during this process since disturbance could result in sloughing of the ditch bank into the ditch, which could reduce flow of water in the ditch and defeat the purpose of the maintenance activity. The materials removed from ditches are placed back from the adjacent bank and tilled into the field soils.

In an effort to increase efficiency and further minimize disturbance of ditch banks, District #15 has recently acquired a specialized bucket attachment specifically designed for this purpose. The bucket acts as a kind of "mower," scooping and cutting the vegetation away from the bank without disturbing the soil. Other districts are investigating the possibility of purchasing or constructing similar "mower buckets" for use throughout the Planning Area. Exhibits 2-6 and 2-7 show a demonstration of the use of this specialized bucket.

Exhibit 2-6. Specialized Mower Bucket

Exhibit 2-7. Ditch Cleaning with Mower Bucket

Maintenance activities associated with equipment such as tide gates and pumps include the following:

- Cleaning and removal of debris from tide gate entrances and trash racks is performed as needed to ensure that the flow of water is not impeded and that blockages do not develop. Typically, the debris that collects in tide gates and trash racks is small and easily removed with hand tools. Occasionally, larger debris is removed from the bank using mechanical equipment similar to that used for ditch cleaning. Materials are deposited on the adjacent bank or disposed of as necessary.

- Lining and replacement of tide gate tubes (culverts) is occasionally necessary to extend the life of the tide gate facility or to restore impaired function. Tubes typically collapse due to corrosion of the large metal culvert or conduit that passes through the dike structure. Lining and replacement of tubes is typically completed during the fall months.

- Replacement of bolts, hinges, flappers, and other small appurtenances associated with tide gates and flood gates is routinely performed as needed due to corrosion and wear of moving parts.
- Cleaning, repair, or replacement of fish screens is routinely performed to prevent clogging, damage, or failure of screens. This work is performed as needed, but typically is conducted in the fall months during routine pump inspection and maintenance.
- Repair or replacement of pump mechanisms is usually performed during routine inspections, which reveal wear or conditions that could cause the pump to become impaired or fail.
- Emergency repairs and/or replacement may be required during or immediately following a storm or other high water event, when damage to drainage infrastructure or equipment has occurred that would pose an imminent threat to agricultural lands or structures.

Maintenance of the drainage system is conducted using Best Management Practices (BMPs) as described for each individual district in its Drainage Maintenance Plan (DMP). The DMPs were produced by the districts in cooperation with WDFW and the Skagit River System Cooperative (SRSC), and are designed to meet the needs and circumstances within each individual district.

The DMPs are a product of the Skagit Drainage and Fish Initiative, a multi-year, ongoing planning process for salmon recovery and preservation of agriculture in the Skagit Valley (Smith and Manary, 2005). As statewide salmon recovery efforts have gained momentum in recent years, the use and maintenance of tide gates has become an increasingly contentious issue. In April 2003, the State Legislature passed Engrossed Second Substitute House Bill (ESSHB) 1418, which specifically excluded fish passage as a condition of hydraulic project approval (HPA) for tide gates. It also provided a framework for local task forces to jointly develop intertidal habitat restoration plans where limiting factors analysis has shown insufficient intertidal salmon habitat, such as in the lower Skagit estuary (Smith, 2003). As a result of this legislation, a “1418 Task Force” was assembled, including representatives from local, state, and federal agencies; drainage districts; and tribal organizations. The goal of the Task Force was to identify and prioritize intertidal salmon habitat enhancement sites within the context of science-based salmon recovery and protection of agricultural land. The result of this effort is documented in the *House Bill 1418 Report*, issued in 2005 (Smith and Manary, 2005).

In February 2005, as a result of the Task Force efforts, WWAA and WDFW signed a Memorandum of Understanding (MOU) which stipulates that WDFW will enter into Drainage Maintenance Agreements (DMAs) with each individual district. The DMAs are designed to ensure that activities and infrastructure associated with agricultural land drainage will meet the needs of both parties with regard to viability of agriculture, fish protection, and habitat enhancement.

Each district’s DMA includes the following key elements:

- BMPs and maintenance schedules specific to each type of watercourse found within the district, designed for the individual district conditions and needs.
- A DMP specific to each district which identifies the boundaries of the district, watercourses, and facilities covered under the DMA.

- Detailed inventories and maps of the description and location of drainage facilities within the district.
- The resulting HPA application and/or approved HPA, and other documents that permit the necessary maintenance activities within the district.

Each of the districts participating in this CIDMP has developed a DMA and a DMP.

The BMPs included in each DMA/DMP are consistent with BMPs required by Skagit County's Critical Areas Ordinance (CAO) (Skagit County Code, Chapter 14.24). The CAO states that agricultural activities must not harm or degrade the existing functional values of fish and wildlife habitat conservation areas in and adjacent to watercourses. This "no harm or degradation" standard requires agricultural practices to meet water quality standards required by the Water Pollution Control Act (Chapter 90.48 RCW; Chapter 173-201A WAC); any Total Maximum Daily Load (TMDL) requirements established by the Washington State Department of Ecology (Ecology) (Chapter 90.48 RCW); and applicable requirements of the Hydraulics Code (Chapter 77.55 RCW; Chapter 220-110 WAC).

In 2004, a Mediated Settlement Agreement between Ecology and Marshland Flood Control District in Snohomish County before the Washington Pollution Control Hearings Board (No. 04-118) addressed the issue of drainage maintenance and water quality protection. In this agreement, the parties stipulated that drainage maintenance activities covered by BMPs set forth in an approved HPA were sufficient to meet water quality requirements.

2.2.4 Voluntary Management Practices and Environmental Programs

As discussed above, landowners in the Planning Area employ BMPs required by various local and state regulations. Comprehensive BMPs, developed as part of the Drainage and Fish Initiative, are designed to address the specific issues associated with each watercourse classification found in the Planning Area. In addition to these mandatory actions, the agricultural community also participates in a variety of voluntary conservation practices, projects, and programs intended to protect the environment while ensuring the viability of agriculture in the Skagit Basin.

Skagit Conservation District

The Skagit Conservation District provides information and technical assistance to farmers interested in improving their land and farm management practices. The District provides assistance with activities such as farm planning, mud and manure management, composting, roof water diversion, pasture management, livestock fencing and watering, stream and wetland water quality, wildlife habitat enhancement, and regulatory assistance. The District also partners with other organizations such as WWAA and local government to promote voluntary conservation and environmental protection efforts that are congruous with the District's goal of protecting and preserving prime agricultural land in the Skagit Basin.

On-farm Conservation Practices

Many landowners in the Planning Area employ voluntary on-farm conservation practices intended to minimize detrimental impacts or provide beneficial impacts to the land and natural environment. Such conservation practices include:

- Bank plantings – vegetation planted adjacent to a drainage facility to reduce water temperature and noxious weeds.
- Cover crops and crop rotation – planting of crops on fallow fields to minimize soil erosion.
- Sediment catch basins – basin designed to trap and collect sediment.
- Vegetated field borders and filter strips – designed vegetated strips that filter surface runoff.
- Riparian fencing – used to exclude livestock, vehicles, and humans from accessing drainage facilities.

Partnerships and Programs

Recent programs and projects in which WWAA and the agricultural community have participated include:

- Skagit Drainage and Fish Initiative – a cooperative effort by WDFW, the Skagit River System Cooperative, and WWAA (see Section 2.2.3).
- Washington State Department of Agriculture (WSDA) Pesticides Surface Water Study (see Section 3.1.5).
- Rawlins Road Feasibility Project – partnership with the Skagit Watershed Council to evaluate options inside and outside the dike system for restoration and channel construction.
- Bayview Watershed Stormwater Plan – integrated stormwater management to address development pressures in the Bayview area and potential stormwater loading to the agricultural drainage network.
- Skagit Tribal-Agricultural Alliance – goal is to foster communication and collaboration between the farm and tribal communities.
- Shared Strategy for Puget Sound – voluntary partnership of regional interests to develop a Puget Sound based plan for Chinook salmon recovery; participation in the Development Committee and the recently formed Puget Sound Salmon Recovery Council.
- Puget Sound Partnership – a regional initiative to develop an action plan for the cleanup of Puget Sound by the year 2020.
- WWAA-Skagit County Contract – working with Skagit County elected officials and staff on agricultural policy issues.
- Stewardship Partners – helps landowners restore and preserve natural landscapes of Washington by promoting and implementing incentive-based programs that encourage fish and wildlife conservation activities, including the salmon-safe farming certification program.

- Conservation Reserve Enhancement Program (CREP) – a joint partnership between the State of Washington and the United States Department of Agriculture that provides incentives to restore and improve salmon and steelhead habitat on private land.
- Barley for Birds Program – a partnership with WDFW and Ducks Unlimited which leases land from farmers and encourages the planting of barley as a cover crop in order to increase bird populations.
- "Crops for Critters" project – partnership with The Nature Conservancy to identify economically viable rotational crops and field management techniques that provide shorebird habitat.

2.3 Land Use and Land Cover

2.3.1 Skagit County Land Use Designations

Land use designations and analysis provided in this section are based on the *Skagit County Comprehensive Plan* (Skagit County Planning and Development Services, 2003) and the *Skagit County Growth Management Indicators (GMI) Report* (Skagit County Planning and Development Services, 2002). The Comprehensive Plan was originally adopted in 1997 and was updated by amendment in 1998 and 2000. The Comprehensive Plan sets goals and objectives for growth management through the year 2015. The GMI Report provides analysis of current trends in an effort to monitor the County's success in implementing the Comprehensive Plan.

Table 2-2 provides land use designations and associated acreage in Skagit County. Nearly half the County land area, or 47 percent of the total acreage, is in federal, state, or other public ownership, primarily for use as parks and open space. Natural Resource Lands, including Forest and Rural Resource lands, comprise 35 percent of the County's land area. Rural, Commercial/Industrial, and Urban Growth Areas make up 10 percent of the County's acreage. Agricultural Lands comprise the remaining 8 percent of the County's land area, a total of 89,489 acres.

One of the key tenets of the Growth Management Act and the County's Comprehensive Plan is to direct the majority of future growth and development toward urban areas, while preserving the character and function of rural and natural resource lands. The GMI Report indicates that the County is making progress toward achieving this goal. Data indicate that approximately 80 percent of both population growth and housing starts countywide has occurred in Urban Growth Areas from 1998 to 2001. Of the non-Urban Growth Area building permits issued from 1995 to 2001, approximately 84 percent of the permits occurred in rural areas, while only 16 percent were on natural resource lands.

Table 2-2. Land Use Designations in Skagit County, WA

Land Use Category	Acres	Percent
Agriculture	**89,489**	**8%**
Natural Resource Lands (Forest, Rural Resource)	386,531	35%
State / Federal and other Public Lands	518,568	47%
Rural Lands	81,317	7%
Commercial / Industrial Lands	621	0%
Urban Growth Areas	35,420	3%
Total	1,111,946	100%

Source: Skagit County Planning and Development Services, 2003

The acreage associated with these land use designations within the Planning Area is summarized in Table 2-3 and shown graphically in Exhibit 2-8. A total of 58,155 acres, or 92 percent of the Planning Area, is designated for agricultural use. The legal boundaries of the districts in this CIDMP include 92 percent of this land (see Table 2-1). The remaining 4,833 acres of agricultural land within the Planning Area are not legally part of the districts, but are included in the analysis throughout this CIDMP. The Planning Area includes 65 percent of the 89,489 acres designated for agriculture in Skagit County.

Table 2-3. Land Use Designations in the Planning Area

Land Use Category	Acres	Percent
Agriculture	**58,155**	**92%**
Natural Resource Lands (Forest, Rural Resource)	173	0%
State / Federal and other Public Lands	105	0%
Rural Lands	3,612	6%
Commercial / Industrial Lands	171	0%
Urban Growth Areas	1,075	2%
Total	63,292	100%

Source: Skagit County Planning and Development Services, 2003

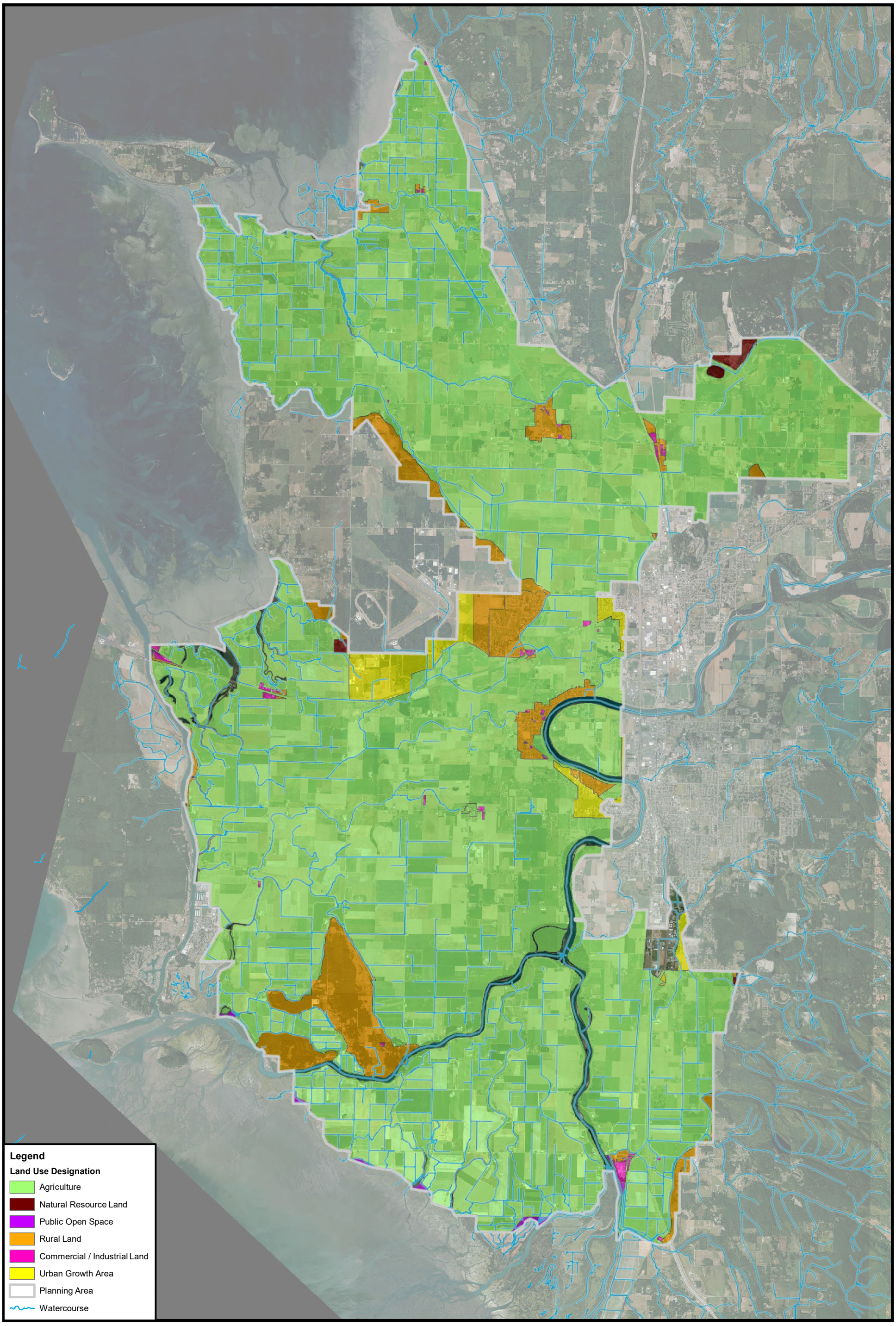

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Exhibit 2-8
Land Use Designations In Planning Area

Skagit Basin CIDMP
Western Washington Agricultural Association

October 2006

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2.3.2 Agriculture in Skagit County

Data and information on agricultural land use provided in this section are based on *2003 Skagit County Ag Stats*, produced by the Washington State University / Skagit County Cooperative Extension (WSUCE Skagit County, 2003). The annual Ag Stats report provides county-level data and analysis, largely based on the *2002 Census of Agriculture* as well as on local interviews and data collection (WSDA, 2004). Additional information relating to agricultural activities specific to the Planning Area was provided by WWAA and the Technical Advisory Team (TAT).

Of the 89,489 acres designated for agricultural use in Skagit County, the Ag Stats report showed that 62,074 acres (69 percent) were harvested in 2002. Table 2-4 provides a summary of historical and current acreage devoted to crops in Skagit County. Eight primary crops, including field crops, potatoes, peas, cucumbers, berries, flower bulbs, and vegetable and grass seed account for 53,880 (87 percent) of the acreage harvested in 2002. The *2002 Census of Agriculture* reported that pasture land harvested in 2002 accounts for an additional 2,673 acres (4 percent). Table 2-4 demonstrates the changes in crop patterns that have occurred in Skagit County in recent years, as market conditions have influenced farmers' crop choices. For example, acreage of potatoes, a high-value crop, has increased significantly since 1978, while acreage of peas has decreased. The *2002 Census of Agriculture* reports an estimated 17,658 of the acres harvested in 2002 (28 percent) were irrigated.

Table 2-4. Summary of Historical and Current Crop Acreage in Skagit County[1]

Crop	1978		1990		2002	
	Acres	Percent	Acres	Percent	Acres	Percent
Field crops (alfalfa, barley, corn & grass silage, grass, hay)	25,000	48%	33,050	52%	28,355	46%
Potatoes	1,520	3%	7,250	12%	12,500	20%
Peas	15,898	30%	14,880	23%	4,196	7%
Cucumbers	1,094	2%	1,900	3%	3,000	5%
Raspberries and blueberries	524	1%	420	1%	2,200	4%
Strawberries	550	1%	615	1%	550	1%
Flower bulbs (tulip, daffodil, iris)	n/a	n/a	n/a	n/a	1,500	2%
Vegetable seed (beet, cabbage, rutabaga, spinach)	4,891	9%	3,375	5%	1,204	2%
Grass seed	n/a	n/a	n/a	n/a	375	1%
Carrots	890	2%	468	1%	0	0%
Sweet corn	1,098	2%	616	1%	0	0%
Apples	n/a	n/a	103	0%	300	0%
Misc. crops (bamboo, Christmas trees, tea, herbs, poplar)	975	2%	665	1%	3,847	6%
Pasture[2]	n/a	n/a	n/a	n/a	2,673	4%
Other crops[3]	n/a	n/a	n/a	n/a	1,374	2%
Total	-	-	-	-	62,074	100%

[1]Source: WSUCE Skagit County, 2003, unless otherwise stated
[2]Source: WSDA, 2004
[3]Crop type not reported in 2003 *Skagit County Ag Stats.*

2.3.3 Agriculture in the Planning Area

In addition to county-level estimates, it was necessary to estimate crop acreage and patterns specific to the Planning Area as part of this CIDMP. Data and information provided in this section are based on a crop survey conducted by WSDA as part of an ongoing state-wide study of agricultural use of pesticides (WSDA, 2006). The survey collected information on crop patterns and irrigation during the 2005 growing season. WWAA members reviewed this data and provided additional clarification specific to parcels located in the Planning Area. Estimates of harvested and irrigated acres by crop in the Planning Area were developed using this data and information provided by WWAA and by farmers with local knowledge. These estimates are summarized in Table 2-5.

Note that Table 2-5 includes estimates of several crops which are were not discussed in the Ag Stats report (Table 2-4), while other crops identified in the county-level data are not included. These deviations from the county-level data were based on input from WWAA members and were made in an effort to better characterize agricultural activities within the Planning Area.

The WSDA survey reported a total of 49,896 acres harvested within the Planning Area in 2005. This represents 86 percent of the 58,155 acres zoned for agriculture in the Planning Area (Table 2-3) and 94 percent of the 53,322 acres included in the districts (Table 2-1). Of the 49,896 acres harvested in 2005 in the Planning Area, approximately 15,684 acres (31 percent) were irrigated. The WSDA survey includes detailed geographic data on the location and extent of various crops; however, State public disclosure laws prohibit publication of this data to protect proprietary information of the agricultural community. Thus, maps associated with Table 2-5 could not be provided in this CIDMP document.

Table 2-5. 2005 Harvested and Irrigated Acres by Crop in the Planning Area

Crop	Harvested Acres	Irrigated Acres	
		Acres	Percent
Potatoes	10,083	9,139	91%
Field crops (alfalfa, grass, clover, ryegrass, green manure)	7,950	0	0%
Cereal grains (wheat, barley, field corn, oat, sorghum, wildlife feed)	6,303	0	0%
Corn silage	5,674	2,057	36%
Peas	3,356	0	0%
Vegetable seed (spinach, beet, cabbage, mustard)	2,989	143	5%
Raspberries and blueberries	2,433	2,060	85%
Vegetables (beans, broccoli, cabbage, corn, cauliflower, pumpkin)	2,204	573	26%
Other crops (nursery, vineyard, tea, unknown)	2,194	583	27%
Cucumbers	1,943	294	15%
Pasture	1,765	248	14%
Flower bulbs (daffodil, iris, tulip)	1,340	0	0%
Turf	419	346	83%
Trees (poplar, Christmas trees)	412	0	0%
Strawberries	305	28	9%
Grass seed (ryegrass, bluegrass)	279	0	0%
Apples	247	213	86%
Total	49,896	15,684	31%

Source: WSDA, 2006

2.4 Irrigation Needs in the Planning Area

2.4.1 Estimated Existing Water Use

Several factors must be considered in estimating crop water use, including irrigation efficiency, individual crop water requirements, soil composition, climate and precipitation, and other parameters. The most effective way to determine water usage is through the use of water meters. Few irrigation facilities in the Planning Area are currently metered. Therefore, estimates of crop water needs have been developed for this CIDMP.

Table 2-6 summarizes the number of acres irrigated with each type of irrigation equipment utilized in the Planning Area. The efficiency of water use varies by the type of irrigation equipment used; thus, it is useful to know what type of equipment is used when estimating water use for irrigation. The total acres irrigated with each equipment type, as presented in Table 2-6, are based on observations of equipment types being used in the Planning Area during the WSDA crop survey, augmented by information provided by WWAA based on its local knowledge of typical irrigation practices in the Planning Area. The large majority (82 percent) of crops are irrigated with big gun systems. This method is preferred in large part due to equipment and labor costs.

Table 2-6. 2005 Irrigated Acres in the Planning Area by Type of Irrigation Equipment

Crop	Irrigated Acres	Equipment Type					
		Drip		Sprinkler		Big Gun	
		Acres	%	Acres	%	Acres	%
Potatoes	9,139	0	0	0	0	9,139	100
Raspberries and blueberries	2,060	1,460	71	23	1	577	28
Corn silage	2,057	0	0	0	0	2,057	100
Other crops (nursery, vineyard, tea, unknown)	583	90	15	367	63	126	22
Vegetables (beans, broccoli, cabbage, sweet corn, cauliflower, pumpkin)	573	0	0	274	48	299	52
Turf	346	0	0	346	100	0	0
Cucumbers	294	0	0	0	0	294	100
Pasture	248	0	0	0	0	248	100
Apples	213	201	94	12	6	0	0
Vegetable seed (spinach, beet, cabbage, corn, mustard)	143	0	0	0	0	143	100
Strawberries	28	0	0	0	0	28	100
Total	15,684	1,751	11	1,022	7	12,911	82

Source: WSDA, 2006

Data and analysis of estimated water use for irrigation, as described in this section, are based on estimates of Crop Irrigation Requirements (CIRs) provided in the *State of Washington Irrigation Guide* (Irrigation Guide) published in 1985 and updated in 1990 and 1992 by The U.S. Department of Agriculture in cooperation with the Washington State Cooperative Extension Service (WSDA, 1985; USDA, 1992). The Irrigation Guide is considered to be the best available method for estimating crop water usage in Washington, and is used by Ecology to determine the appropriate amount of water needed when issuing or changing water rights.

Several assumptions were made in an effort to adapt the CIRs provided in the Irrigation Guide to the existing conditions and water needs in the Planning Area. First, the 1985 Irrigation Guide does not provide CIRs for some crops grown in the Planning Area, so estimated CIRs for these crops were based on similar crop CIRs. For example, the CIR for cucumbers was used to estimate the CIR for other vegetables. Second, the 1992 Irrigation Guide provides CIRs for pasture and field corn for the Mount Vernon area, which provides a more accurate estimate than the CIRs for Sedro-Woolley provided in the 1985 Irrigation Guide due to differences in precipitation between the two locations. Unfortunately, not all crop CIRs are provided for the Mount Vernon location, and those that are provided are for a 2-year return. Thus, the CIRs provided for Mount Vernon were modified to take into account a 10-year return, and the CIRs for Sedro-Woolley were modified to take into account the decrease in precipitation associated with the Mount Vernon location. The resulting estimated CIRs and the method used to calculate each are described in Table 2-7.

It is important to note that the crop water requirements presented in Table 2-7 represent a 10-year return; this is the estimated amount of water needed to grow a crop 90 percent of the time, or the amount of water that would be sufficient 9 of every 10 years. The 10-year return requirements were used in this analysis because they provide the most detailed, crop-specific information available, and because these requirements are used by Ecology for issuing water rights, which are intended to provide enough water in most years.

Table 2-7. Estimated Crop Irrigation Requirements (CIRs) in the Planning Area

Crop	CIR (inches / year)	Source / Method of Calculation
Potatoes	13.75	1985 CIR, 10-yr return, Sedro-Woolley; added 1.75 inches to account for Mt Vernon precipitation
Raspberries and blueberries	14.75	1985 CIR (raspberries), 10-yr return, Sedro-Woolley; added 1.75 inches to account for Mt Vernon precipitation
Corn silage	11.2	1992 CIR, 2-yr return, Mt Vernon; added 3 inches to account for 10-year return
Other crops	7.75	No CIR provided in Irrigation Guide; estimate based on CIR for cucumbers
Vegetables	7.75	No CIR provided in Irrigation Guide; estimate based on CIR for cucumbers
Turf	18.35	1992 CIR, 2-yr return, Mt Vernon; added 3 inches to account for 10-year return
Cucumbers	7.75	1985 CIR, 10-yr return, Sedro-Woolley; added 1.75 inches to account for Mt Vernon precipitation
Pasture	18.35	1992 CIR, 2-yr return, Mt Vernon; added 3 inches to account for 10-year return
Apples (with cover crop)	20.75	1985 CIR, 10-yr return, Sedro-Woolley; added 1.75 inches to account for Mt Vernon precipitation
Vegetable seed	7.75	No CIR provided in Irrigation Guide; estimate based on CIR for cucumbers
Strawberries	5.75	1985 CIR, 10-yr return, Sedro-Woolley; added 1.75 inches to account for Mt Vernon precipitation

Source: WSDA, 1985; USDA, 1992; Ecology, 2005d

The Total Irrigation Requirement (TIR) is calculated in an effort to take into account both the CIR and the estimated efficiency of the irrigation equipment used. The Irrigation Guide

estimates the efficiency of sprinklers to be between 65 and 75 percent. For this analysis, 75-percent efficiency was used to calculate TIRs for crops irrigated by sprinkler systems. Drip irrigation efficiency is estimated to be 90 percent in the Irrigation Guide. An estimate of 65 percent was used to calculate efficiency for big guns. The Irrigation Guide also recommends consideration of the amount of water required for leaching, or removal of excess minerals from the soil. In this case, the leaching requirement was assumed to be zero due to the field drainage that occurs in the Skagit Basin, and the amount of precipitation that occurs in the winter months.

The following equation, as recommended in the Irrigation Guide, was used to calculate the TIRs presented in this CIDMP:

TIR = (CIR / E) * 100

Where **CIR** = Crop Irrigation Requirement

and

E = Irrigation Efficiency

For example, the TIR for potatoes irrigated with big guns was calculated as follows:

TIR = (13.75 / 65) * 100 = 21.154 inches

The TIR is then divided by 12 to convert inches to feet. This figure is multiplied by the number of acres of each crop to estimate the total acre-feet required in one growing season, as follows, using potatoes as an example:

TIR (feet) = TIR (inches) / 12

= 21.154 / 12 = 1.763 feet

and

Seasonal TIR (acre-feet/year) = TIR (feet) * crop acreage

= 1.763 * 9,139 = 16,110.42 acre-feet per year

Table 2-8 provides a summary of estimated TIRs for irrigation in the Planning Area in 2005. The estimates of irrigated crop acreage described in Table 2-5 and the CIRs described in Table 2-7 were used to calculate seasonal irrigation estimates. Estimates of irrigation equipment types described in Table 2-6 were used to estimate irrigation efficiency. Based on the estimates of crop water needs, irrigation efficiency, and crop acreage described above, an estimated 25,383 acre-feet of water would have been needed to irrigate the estimated acres of crops grown in the Planning Area in 2005. This equates to 1.4 acre-feet per acre.

Table 2-8. Estimated 2005 Total Irrigation Requirement (TIR) by Crop in the Planning Area

Crop	Crop Irrigation Requirement (inches)[1]	Irrigation Efficiency[2]		Total Irrigation Requirement (inches)	Total Irrigation Requirement (feet)	Irrigated Acres[3] (2005)	Estimated Seasonal Irrigation Requirement (acre-feet)
		Type	Percent				
Potatoes	13.75	big gun	65	21.154	1.763	9,139	16,110.42
Raspberries and blueberries	14.75	big gun	65	22.692	1.891	577	1,091.12
	14.75	sprinkler	75	19.667	1.639	23	37.69
	14.75	drip	90	16.389	1.366	1,460	1,993.98
Corn silage	11.2	big gun	65	17.231	1.436	2,057	2,953.64
Other	7.75	big gun	65	11.923	0.994	126	125.19
	7.75	sprinkler	75	10.333	0.861	367	316.03
	7.75	drip	90	8.611	0.718	90	64.58
Vegetables	7.75	big gun	65	11.923	0.994	299	297.08
	7.75	sprinkler	75	10.333	0.861	274	235.94
Turf	18.35	sprinkler	75	24.467	2.039	346	705.46
Cucumbers	7.75	big gun	65	11.923	0.994	294	292.12
Pasture	18.35	big gun	65	28.231	2.353	248	583.44
Apples	20.75	sprinkler	75	27.667	2.306	12	27.67
	20.75	drip	90	23.056	1.921	201	386.18
Vegetable seed	7.75	big gun	65	11.923	0.994	143	142.08
Strawberries	5.75	big gun	65	8.846	0.737	28	20.64
Total	-	-	-	-	1.404 (avg.)	15,684	25,383.27

[1]Source: Table 2-7
[2]Source: Table 2-6; WSDA, 1985; USDA, 1992; Ecology, 2005d
[3]Source: Table 2-5

2.4.2 Existing Water Rights, Water Right Claims, and Pending Applications

The analysis of water rights, claims, and pending applications provided in this section is based on data from the Water Right Tracking System (WRTS). The WRTS is a database maintained by Ecology that is used to track water right applications, permits, certificates, and claims, and their associated locations and amounts of water. The following key information is shown in WRTS for water right certificates and permits:

- Water right number
- Name associated with water right
- Priority date of water right
- Purpose of use
- Instantaneous rate (Qi) in gallons per minute (gpm) or cubic feet per second (cfs)
- Annual quantity (Qa) in acre-feet per year (afy)
- Irrigated acres

- Location of point of diversion/withdrawal (POD/POW) by Township, Range, Section
- Water Resource Inventory Area (WRIA) of POD/POW
- Source of water

One key piece of information that is not shown in WRTS is the Place of Use. The Place of Use is the legal description of the land area shown on a water right where the amount of water authorized by that right must be used. For a water right which includes irrigation as a water use, the Place of Use shown on the water right is a legal description of the land area where irrigation is allowed to occur. The Place of Use information shown on existing water rights was collected by reviewing individual water right files provided by Ecology.

The WRTS database does not include all the information listed above for pending applications or water right claims. Additional information was gathered for the analysis described below by reviewing individual applications and claims, and by using estimates based on Ecology recommendations and professional judgment.

Water Right Certificates and Permits

The analysis of state-issued water rights in the Planning Area began with review of all ground and surface water rights listed in WRTS that included irrigation as a purpose of use, and that were located within WRIA 3-Lower Skagit/Samish with the Point of Diversion/Withdrawal located in the lower Samish Valley and lower Skagit Valley between Sedro-Woolley on the east and the Swinomish Channel on the west. Irrigation water rights with a Place of Use within the incorporated city limits of Mount Vernon or Burlington, and other rights located outside the Planning Area, were excluded from this list.

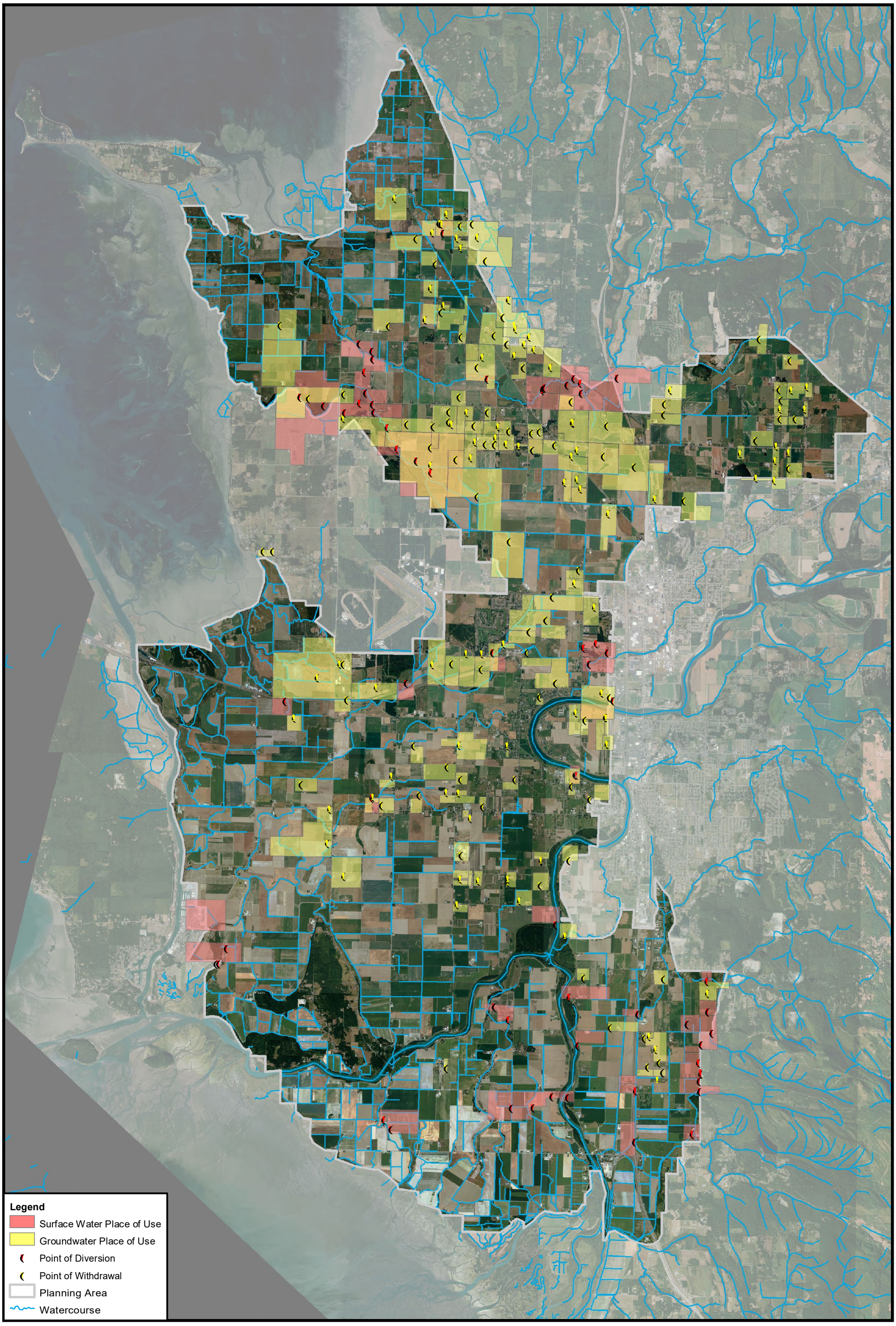
Table 2-9 provides a summary description of all recorded water rights located within the Planning Area. Exhibit 2-9 provides a map of all recorded water rights within the Planning Area. Point of Diversion/Withdrawal and Place of Use of each right are shown in Exhibit 2-9, and surface and groundwater rights are differentiated by color.

Table 2-9. Summary Description of Recorded Water Rights for Irrigation in the Planning Area

Number of Rights		Instantaneous Rate (Qi)		Annual Quantity (Qa)[1]	Irrigated Acres	Acre-Feet / Acre
		gpm	cfs	afy		
Certificates						
Surface	54	10,588	24	3,458	2,456	1.41
Ground	162	35,379	79	11,295	6,906	1.64
Permits						
Surface	0	0	0	0	0	0
Ground	4	1,340	3	366	716	0.51
Total						
	220	47,307	105	15,118	10,078	1.50

Source: Ecology, 2005b

[1]In cases where the Annual Quantity was not reported in WRTS, the acre-feet per year (afy) estimate was calculated using reported irrigated acres multiplied by 2 acre-feet / acre. This estimate is consistent with historical water allocations awarded by Ecology.



Printing Date: October 10, 2006 File: exhibit_2-9.mxd | Source: Ecology, 2005b

Exhibit 2-9

Recorded Water Right Certificates & Permits In Planning Area

October 2006

HDR

0 2,000 4,000 8,000 12,000 16,000 Feet

Skagit Basin CIDMP
Western Washington Agricultural Association

Water Right Claims

A search of Ecology records identified 303 water right claims in the Planning Area that designate irrigation as a use. A preliminary evaluation of these claims was conducted to ascertain the potential number of claims, amount of water, and number of irrigated acres that may be determined to be valid if an adjudication is performed in the Skagit Basin. Until an adjudication is completed in this basin, an evaluation of the validity of any water right claims can be used only for estimation purposes, and has no legal standing as to whether or not an individual claim can be considered a valid water right.

For purposes of this estimate of potentially valid water rights associated with water right claims, the following process was used and assumptions were made:

- The Ecology WRTS database does not show priority dates, instantaneous rate or annual quantity, or irrigated acres; Ecology's records of individual water right claims were used to review each of the 303 claims located within the Planning Area.
- All claims for surface water with a date of first use of 1917 or earlier (date of enactment of the State Surface Water Code, Chapter 90.03 RCW), and all claims for groundwater with a date of first use of 1945 or earlier (date of enactment of the State Ground Water Code, Chapter 90.44 RCW) were reviewed and information collected on each claim, including: priority date, instantaneous rate and annual quantity, irrigated acres, and Place of Use.
- The priority dates used in the analysis were based on the dates shown on each of the water right claims as the date of first use of the water.
- Duplicate water right claims were not included in the analysis.
- Water right claims that were deemed to be duplicates of an identified water right were not included in the analysis.
- Water right claims that included what appeared to be an unrealistic instantaneous rate were not included in the analysis.

Table 2-10 presents a summary of potentially valid water right claims that include irrigation as a use, based on the analysis described above. A total of 53 claims were found to be potentially valid, for a total instantaneous rate (Qi) of 10,771 gpm (24 cfs); a total annual quantity (Qa) of 2,621 afy; and a total of 2,013 irrigated acres.

Three additional claims were identified as having a potentially valid priority date, but were excluded from the analysis because unrealistic instantaneous rates were recorded, as described above.

Five water right claims filed by the Swinomish Tribe of Indians were identified in the Planning Area. These claims listed multiple uses, including irrigation and multiple surface water sources. These Tribal water right claims were not included in the analysis since these claims had what appeared to be extremely high values for the instantaneous rate and annual quantity, and no values were shown for the number of irrigated acres.

Table 2-10. Summary Description of Potentially Valid Water Right Claims in the Planning Area[1]

Number of Claims		Instantaneous Rate (Qi)		Estimated Annual Quantity(Qa)	Irrigated Acres
		gpm	cfs	afy	
Surface	39	5,679	13	1,700	834
Ground	14	5,092	11	921	1,179
Total	53	10,771	24	2,621	2,013

Source: Ecology, 2005b

[1] Table includes claims with Point of Diversion / Withdrawal located within the Planning Area.

Pending Water Right Applications

In addition to state-issued water rights and water right claims, WRTS contains limited data on pending water right applications. A total of 44 pending applications were identified in the Planning Area. These applications do not provide complete information and are not approved water rights; thus, they were not included in the analysis of recorded water rights presented above. However, applications may represent existing or proposed water usage in addition to the authorized water rights shown in Table 2-9 and claims shown in Table 2-10. Available data pertaining to pending water right applications are summarized in Table 2-11.

Table 2-11. Summary Description of Pending Water Right Applications for Irrigation in the Planning Area[1]

Number of Applications		Instantaneous Rate (Qi)		Estimated Annual Quantity(Qa)[2]	Irrigated Acres
		gpm	cfs	afy	
Surface	12	11,122	25	2,073	1,382
Ground	32	11,619	26	4,445	2,963
Total	44	22,741	51	6,518	4,345

Source: Ecology, 2005b

[1] The exact location of the application was not included in the WRTS record.

[2] Acre-feet per year (afy) is not reported in WRTS. Estimate of afy was calculated using reported irrigated acres multiplied by 1.5 acre-feet / acre. This estimate is based on the estimated average TIR of 1.5 afy used for irrigation in the Planning Area (see Table 2-8).

It must be noted that WRTS includes only that information which is recorded on paper applications, water right claims, reports of examination, permits, and certificates. Legal water rights may be different than reported in WRTS due to non-use, changes in use, or other factors. Furthermore, permits and certificates do not represent the full extent of legal water rights.

Homestead Certificates

Several landowners in the Planning Area have documents signed by various Presidents of the United States which have at times been interpreted by landowners as granting them a water right. These documents were reviewed to determine their applicability to the analysis of water right claims in the Planning Area.

The Homestead Certificates were issued under the Homestead Act of 1862. For the person named on the Homestead Certificate, the certificate gives title to 160 acres or less of land.

The provisions of these certificates state that the land title is "....subject to any vested and accrued water rights for mining, agricultural, manufacturing, or other purposes...." meaning that the certificate is for land ownership, and does not include any water rights; rather, the certificate holder is required to honor prior existing water rights on the property. This provision is similar to language in water right law (RCW 90.03.010), which states that when a water right is issued, it is "subject to existing rights", meaning that prior existing water rights held by others must be honored and that the newly issued water right cannot impair any prior existing water right.

The 1969 Water Right Claims Registration Act (Chapter 90.14 RCW) required that a water right claim be filed by anyone claiming the right to the use of water who did not have a water right certificate or water right permit issued by the State of Washington. Whether or not the Homestead Certificates conveyed ownership of a right to the use of water, the certificate holder must have filed a water right claim during the four open periods for registration of water right claims in order to maintain validity of the claim if an adjudication of water rights is conducted in the Skagit Basin.

The landowners in the Planning Area with Homestead Certificates that have filed a water right claim as supporting documentation for any water right, and all potentially valid water right claims, were included in the water right claims analysis described above.

2.4.3 Comparison of Existing Water Rights and Estimated Water Use

The comparison of estimated water use to state-issued water rights, water right claims, and pending applications is shown in Table 2-12. The number of irrigated acres is 56 percent more than allocated under “paper” water right certificates and permits. However, when water right claims are taken into consideration, the deficit decreases; the number of irrigated acres is 30 percent more than allocated under water rights and claims combined. If water pending applications are included in the analysis, the number of irrigated acres is 95 percent, or 5 percent less than the number of acres in water rights, claims, and pending applications combined. Similarly, the estimated annual quantity (Qa) used for irrigation in 2005 is 68 percent greater than allocated in water rights, 43 percent greater than the total allocated under water rights and claims, and 5 percent greater than the total in water rights, claims, and pending applications combined.

It is important to note that the estimated 2005 water use is based on the calculated TIRs shown in Table 2-8 rather than actual water use. As discussed in Section 2.4.1, the TIRs are irrigation requirements calculated using a specific method of applying water to specific crops, and may not accurately reflect the amount of water used for irrigation in the planning area in 2005. These estimates are based on the best available information and are considered conservative; anecdotal accounts from the agricultural community indicate that actual water use was likely less than estimated in 2005.

Table 2-12. Comparison of Estimated Crop Water Use to Water Rights, Water Right Claims, and Pending Applications

		Total Water Rights (State-Issued Certificates and Permits)	Total Water Rights and Water Right Claims	Total Water Rights, Claims, and Applications	Estimated Existing Use (2005)
Irrigated Acres		10,078	12,091	16,436	15,684
Difference between Total Rights and 2005 Irrigated Acres	Acres	-	-	-	5,606
	%	100%	-	-	156%
Difference between Total Rights and Claims and 2005 Irrigated Acres	Acres	-		-	3,593
	%	-	100%	-	130%
Difference between Total Rights, Claims, and Applications and 2005 Irrigated Acres	Acres	-	-	-	(752)
	%	-	-	100%	95%
Annual Quantity (Qa)		15,118	17,739	24,257	25,383
Difference between Total Rights and 2005 Estimated Use	afy	-	-	-	10,265
	%	100%	-	-	168%
Difference between Total Rights and Claims and 2005 Estimated Use	afy	-	-	-	7,644
	%	-	100%	-	143%
Difference between Total Rights, Claims, and Applications and 2005 Irrigated Acres	afy	-	-	-	1,126
	%	-	-	100%	105%

Source: Previous tables

2.4.4 Future Irrigation Needs

It is inherently difficult to assess the potential impact of future changes in irrigation and water use in the Planning Area. Many factors affect irrigation practices and associated water use, including climate, economic pressures, and regional population growth land use practices.

As discussed in Section 2.2, the large majority of agricultural land in Skagit County is included in the Planning Area, and most of the land in the Planning Area is currently being used for agriculture. Thus, it is anticipated that the acreage of land in agricultural use will

remain fairly constant, which is consistent with the goals of Skagit County's Comprehensive Plan, the districts, and this CIDMP.

The future trend with regard to irrigated agriculture is less clear. Since the number of acres in agricultural use is not likely to change significantly, any change in irrigated acreage is likely to result from changes in crop patterns. An increase in the production of crops that require irrigation, such as potatoes or berries, could result in increased water demand. As discussed in Section 2.2 and demonstrated in Table 2-4, historical trends in crop patterns have resulted in growing greater percentages of irrigated crops in the Planning Area; for example, the estimated number of acres of potatoes increased by 87 percent between 1978 and 2002.
However, historical trends are not necessarily a direct indicator of future changes in agricultural production. Farmers' crop choices are directly impacted by economic factors such as crop value, but also tempered by operational or logistical constraints such as water availability. It is uncertain whether the trend toward increased production of irrigated crops will continue.

Skagit County recently commissioned a study of future irrigation demands and water availability. The report, submitted by Hydrologic Services Company in March 2005, used historical data and trends in irrigated crop production to calculate current and future estimates of irrigated acres and water demand in the Skagit River Watershed for a 50-year planning period (HSC, 2005). This report excluded the Samish River Basin, a portion of which is included in the Planning Area (see Section 1.2). The report projected a significant increase in irrigated acreage in the Skagit Basin. The projected number of irrigated acres in the year 2050 ranged from 25,000 irrigated acres using the low end growth rate, up to 52,000 irrigated acres using the high end growth rate. The report projected an associated increase in water use from the current estimated 16,784 acre-feet per year to 28,483 acre-feet in the year 2050 using the low end estimate and up to 59,243 acre-feet using the high end estimate. These estimates were based on linear growth rates extrapolated from historical trends. While the scope of the report does not directly correspond to the CIDMP Planning Area, the wide range of these projections demonstrates the degree of uncertainty with regard to estimating future trends in irrigation and water demand.

An analysis of pending water right applications is another indicator of potential future water demand. As discussed in Section 2.4.2 and summarized in Table 2-10, a total of 44 pending water right applications were identified within the Planning Area, indicating the need for irrigation of 4,345 additional acres. Using an estimate of 1.5 acre-feet per acre, 6,518 additional acre-feet of water would be needed to irrigate the acreage in pending applications. This estimate may be misleading, however, because a water right application could also reflect current use by someone who is trying to obtain a water right for that use. There may also be valid water right claims in the Planning Area that could result in additional irrigated acreage and associated water demand.