CHAPTER 10.
LAND USE ANALYSIS

State guidelines for SMP updates require that local jurisdictions analyze current and projected shoreline use patterns and trends and identify potential conflicts (WAC 173-26-2013)(d)(ii)). Previous chapters of this report characterize the following:

- Current shoreline land use patterns;
- Public access opportunities;
- Future land use as defined by the county's comprehensive plan; and
- Characterization of shoreline ecological processes, functions, and opportunities for restoration.

The general policy goals of the SMA provide for protection of shoreline ecological functions while allowing for "all reasonable and appropriate uses." The Act states:

> *Alterations of the natural condition of the shorelines of the state, in those limited instances when authorized, shall be given priority for single family residences and their appurtenant structures, ports, shoreline recreational uses including but not limited to parks, marinas, piers, and other improvements facilitating public access to shorelines of the state, industrial and commercial developments which are particularly dependent on their location on or use of the shorelines of the state and other development that will provide an opportunity for substantial numbers of the people to enjoy the shorelines of the state* (RCW 90.58.020).

This chapter focuses on trends and projected demand for shoreline uses in Mason County and potential use conflicts that might occur. Potential conflicts in this context are focused on competing objectives or planning priorities inherent in the overall SMA policy intent (e.g., preference for water-dependent uses, public access, and ecological protection and restoration). Potential conflicts may also address conflicts between SMA policy objectives and other interests or regulatory requirements affecting shoreline resources (e.g., levee vegetation maintenance vs. restoration of riparian vegetation).

The chapter begins with a brief summary of Mason County history, beginning with Native American settlement. This is intended to provide greater historical context to land use trends and projected demand.

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10.1 History of Mason County

10.1.1 Native American Settlement and Historic Land Use

Mason County is within the territory of the Skokomish and Squaxin peoples. The Skokomish, also known as the Twana people, historically lived along the Hood Canal shorelines and along major rivers, including the Skokomish, and were unified across tribal villages by a common language and culture.

The Skokomish primarily subsisted on salmon harvested in Hood Canal's tributary rivers, including the Union River and Mission Creek. Fishing techniques included the use of fish traps and dipping nets, at which point fish were prepared for immediate fresh consumption or dried for winter consumption. Shellfish, including clams, crab, and oysters, were harvested from Hood Canal shorelines during summer months. Some hunting of terrestrial animals, as well as root, berry, and other plant resource collection, also occurred.

Structures of the Twana Culture (Elmendorf and Collins, 1974) provides an ethnographic history of the Skokomish Tribe's pre-contact and historical use throughout the Mason County area. The Skokomish lived in summer season hunting and fishing camps as smaller family units and gathered during winter months in larger family-based winter villages. The winter villages consisted of one or more larger plank houses, constructed of split Western red cedar. All Skokomish structures were of a cedar lodge construction style. Many camp sites along the lower and North Fork reaches of the Skokomish River are documented in *Structures of the Twana Culture* as well as several along the west shoreline of the Hood Canal. During summer months, these camp sites were formed for their proximity to migrating salmon and to other coastal and upland food resources.

The Skokomish signed the Treaty of Point-No-Point in 1855 along with several other area peoples. The U.S. government was eager to clear title to the lands for logging and Euro-American settlement purposes. As a result, the Skokomish moved out of many historic villages to reside within the Skokomish Reservation, located around the lower Skokomish River and extending along the Hood Canal shoreline north to the Potlatch Vicinity.

Adjoining the Skokomish people to the southeast were the Squaxin people, a group that predominantly inhabited the shorelines and rivers surrounding North Bay, Case Inlet, and other south Puget Sound shorelines within and outside of Mason County. The Squaxin lived in similar cedar plank lodges to the Skokomish, and also similarly subsisted on a combination of salmon, land mammals, some birds, and native edible

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vegetation. The Squaxin, however, used a different dialect and had differing cultural customs.

The Squaxin signed the Medicine Creek Treaty in 1854. The treaty, signed along with the Nisqually and Puyallup Tribes, was the first of the Washington Territory, and ceded ancestral Squaxin Island lands to the U.S. government. As a result the Squaxin moved out of historic villages to reside within the Squaxin Island Reservation between Peale Passage and Squaxin Passage. Over time, individuals living on the reservation began leaving the island to move to surrounding areas in the vicinity of their original homes. By 1959, only four Squaxin Island tribal members remained on Squaxin Island, and today there are no full time residents on the island (Squaxin Island Tribe, 2011). Squaxin Island tribal headquarters have been established in Kamilche, a community approximately 5 miles south of Shelton along Highway 101. Significant portions of Kamilche and the surrounding area are part of the Squaxin Island Indian Reservation. The reservation area of Squaxin Island is actively used for fishing, hunting, camping, and other activities. Access to Squaxin Island is restricted to tribal members and others invited by tribal members (Squaxin Island Tribe, 2011).

10.1.2 Euro-American Settlement and Historic Land Use

The first non-native presence in Mason County occurred in 1792 when George Vancouver of the British Royal Navy explored and mapped Hood Canal. In the 1830s, fur traders built a camp where the Skokomish River empties into Hood Canal, the site that would later become Union City. In 1842, Lieutenant Charles Wilkes explored and mapped South Puget Sound as part of a U.S. exploring expedition (Wilma, 2006).

Americans settled the Puget Sound region beginning in the 1840s. Settlers arrived at Cota Valley in 1853 and opened a sawmill on Hammersley Inlet (Wilma, 2006). Settlement along Hood Canal did not occur until the 1850s, following the 1855 Treaty of Point-No-Point. The first settlers came to the area seeking to find fertile farmland, but quickly discovered that much of the area lacked ideal soil conditions for successful farming. The Skokomish Valley was used for limited agricultural activity at that time, with the earliest settlers arriving between 1859 and 1870. Successful agricultural activities in the area included the production of large hay crops, poultry and eggs. Throughout Mason County, the main industries were logging and, to a lesser extent, oyster farming.

The County was formed as Sawamish County in 1854 and was renamed Mason County in 1864. Shelton was founded in the Cota Valley in 1885 and became the county seat (center of the county government) in 1888. The timber industry

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continued to grow and thrive in the County until the timber supply began to diminish in the 1930s. In 1946, the U.S. Forest Service signed an agreement with Simpson Mills to manage the forest as a single unit until the timber could be replenished.

Beginning in the 1920s, recreation became a major industry in the County as several resorts were established along Hood Canal. In 1964, a State Corrections facility opened and became a major employer in the County. The logging industry started to decline again in the early 1980s. The same decade saw an increase in jobs at the State Corrections facility and in the recreation industry. In the 1980s and 1990s, there was an increase in citizens who commuted from their homes in Mason County to jobs in Olympia and Tacoma (Wilma, 2006).

When oysters became a popular food item in Seattle and San Francisco, settlers in Mason County started harvesting shellfish at low tides. When Washington became a state, the legislature allowed purchase of tidelands. This allowed both harvesting and cultivation of oysters, including methods such as top floats and dikes (Wilma, 2006). By the early 20th century, oysters were in decline due to over-harvesting, industrial development, human occupation, and logging-related pollution. Oakland Bay oyster beds were particularly damaged by red liquor discharged by the Rainier Pulp mill (Wilma, 2006). Oakland Bay shellfish production stopped until the 1970s when Taylor Shellfish Incorporated repurchased the tidelands from the mill (Cascade Land Conservancy, 2010). Eventually, *Ostrea gigas* oysters were transplanted from Japan and came to dominate the market (Wilma, 2006). Manila Clam was also introduced accidentally into Puget Sound in the 1920s. Eventually, residents of Mason County began harvesting the Manila Clam, and the county is now the largest producer of Manila Clams in the nation (Cascade Land Conservancy, 2010).

In the 1980s, the Boldt Decision granted tribes sovereign rights to fish species, but the decision was not clear about shellfish. The tribes filed a federal lawsuit which was resolved in 2006, granting tribes rights to 50 percent of shellfish on state lands and unfarmed private lands (Cascade Land Conservancy, 2010).

Shellfish farming remains a very important industry in Mason County, and an annual celebration called Oyster-Fest, started in the 1980s, takes place at the Mason County fairgrounds in Shelton each year (Wilma, 2006).

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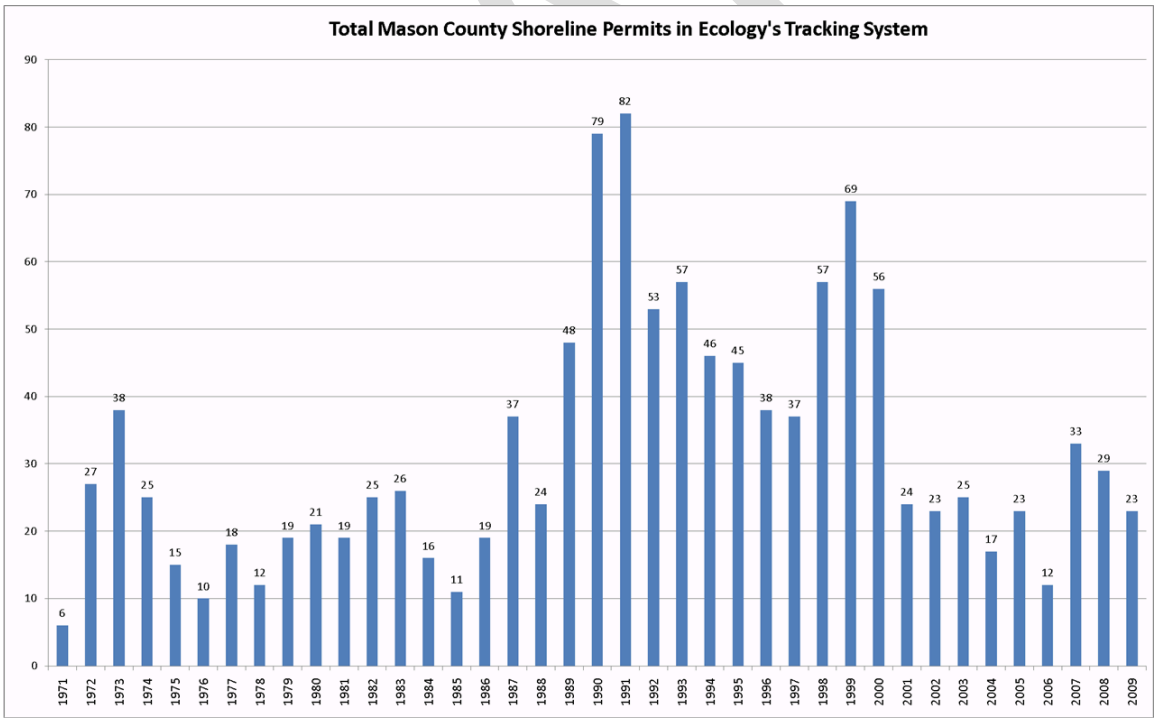
10.2 Trends and Future Demand

10.2.1 Shoreline Development and Trends

Permit History

The current Mason County Shoreline Master Program was adopted in 1975. Under the requirements of the current program, certain types of proposed development in the shoreline area must obtain a Shoreline Substantial Development Permit, Conditional Use Permit and/or a Shoreline Variance. Developments that are exempt from having to obtain Shoreline Substantial Development Permits include single-family developments, single-family docks/piers, and single-family bulkheads. The Washington State Department of Ecology (Ecology) has a permit-tracking database of shoreline permits the County has submitted to Ecology for review or approval. Figure 10-1 below illustrates the total amount of shoreline permits received by Ecology for each year between 1971 and 2009.

Figure 10-1. Mason County Shoreline Permits – Total Permits by Year

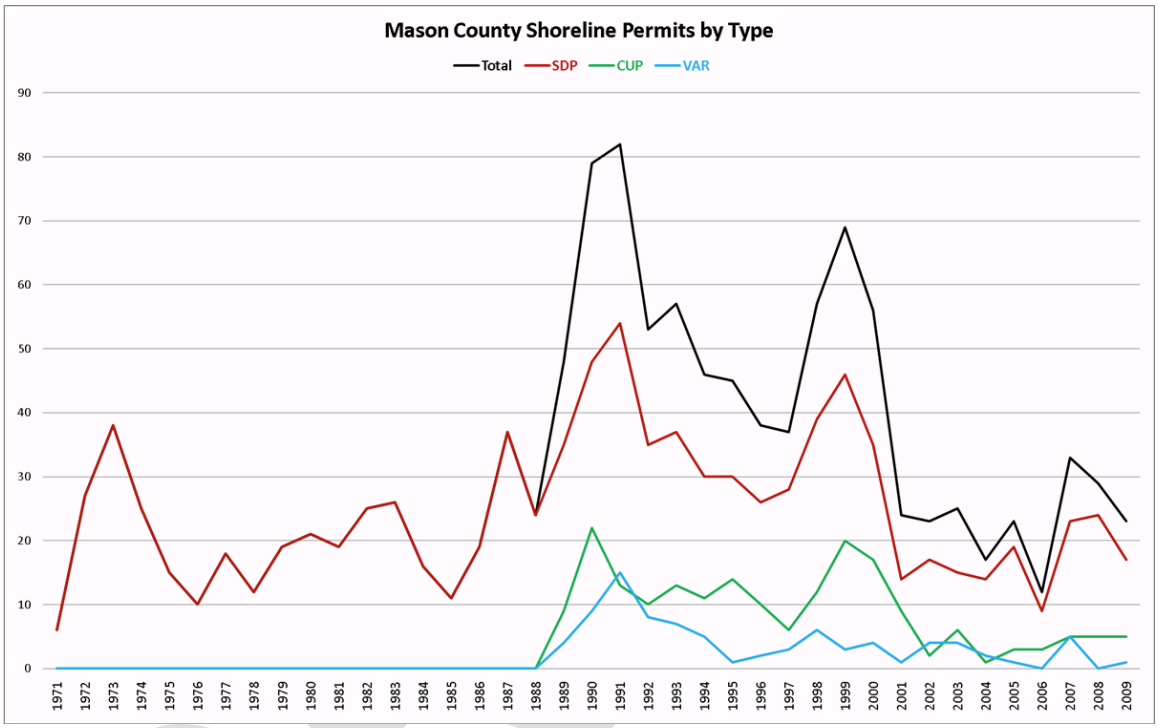


The total number of shoreline permits peaked in 1989 and 1990 with 82 permits submitted to Ecology. There was a gradual drop in permits until another peak in

permits occurred in 1999 with a total of 69 permits submitted. The number of permits have been on a gradual decline, on average, since the late '90s.

Figure 10-2 below also shows the number of permits submitted to Ecology by year but differentiates between the different types of shoreline permits.

Figure 10-2. Mason County Shoreline Permits – Permit Types by Year



Shoreline Substantial Development Permits (SDP) have historically been the most common type of shoreline permit requested for county approval. Conditional Use Permits (CUP) and Variances (VAR) are requested much less often and only began to be processed in the late 80s. Recently, very few variances or CUPs have been sought.

Land Capacity Analysis

To determine future growth in the shoreline area, the 2003 shoreline guidelines suggest that the County's land capacity analysis be reviewed and documented. Mason County prepared a land capacity analysis as part of the 2005 Comprehensive Plan Update (Mason County, 2005). The analysis was based on parcel data and zoning districts and was used to determine the population potential should each parcel be developed to its fullest residential capacity, as allowed under the zoning district. Although the analysis was prepared more than five years ago and the County's population has grown by 12.6 percent since 2005 - from 53,884 in 2005 to

60,699 in 2010, the analysis is the most readily available information (U.S. Census, 2011a and 2011b).

Table 10-1 shows the distribution of existing land uses within Mason County's rural areas according to the Mason County Assessor's data (December 2004). The table excludes parcel data from Allyn, Belfair, and Shelton urban growth areas.

Table 10-1. Mason County Rural Areas Land Use

Existing Land Use	Improved		Unimproved		Timber		Total	
	Acres	%	Acres	%	Acres	%	Acres	%
Residential	27,700	89%	3,410	11%	0	0%	**31,110**	**7%**
Vacant	9,200	18%	41,524	81%	245	<1%	**50,969**	**11%**
Commercial	1,144	39%	1,801	61%	20	1%	**2,965**	**1%**
Industrial	121	86%	19	14%	0	0%	**140**	**<1%**
Agriculture/Aquaculture	8,716	93%	660	7%	0	0%	**9,376**	**2%**
Forestry	1,870	1%	8,931	6%	128,346	92%	**139,147**	**31%**
Long Term Commercial Forest	710	0%	46,507	23%	152,373	76%	**199,590**	**45%**
Mineral Extraction	103	77%	30	23%	0	0%	**133**	**<1%**
Transportation	1,385	87%	200	13%	0	0%	**1,585**	**<1%**
Utilities	161	8%	1,773	92%	1	<1%	**1,935**	**<1%**
Tax Exempt	2,893	29%	7,107	71%	4	<1%	**10,004**	**2%**
Total	**54,003**	**12%**	**71,962**	**16%**	**280,989**	**63%**	**446,954**	**100%**

Note: Percentages in table have been derived based on acreage values shown in Table IV.3-7 of the 2005 Mason County Comprehensive Plan.

The land use categories listed in Table 10-1above are described in more detail in the Mason County Comprehensive Plan (2005) and summarized briefly below:

1. Residential – properties that have any type of dwelling unit except those with an improvement value of less than $20,000.

2. Vacant – properties that have been determined to be vacant by the Mason County Assessor and properties with an improvement value of less than $20,000.

3. Commercial – properties used for wholesale and retail trade, service industries, health care providers, warehouses, and privately owned open space and recreation facilities.

4. Forestry – properties in open space forest lands, classified forests, designated forest lands, forest-related activities, and Christmas tree farms.

5. Long Term Commercial Forests – lands designated as Long Term Commercial Forests under Mason County's Resource Ordinance (Ordinance number 77-93).

6. Mineral Extraction – properties that are associated with mining activities and services.

7. Transportation – all parcels related to transportation uses including railroads, rights-of-way, motor vehicle transportation, aircraft runways and parking lots.

8. Utilities – parcels used for utility-related purposes including communications, electrical, natural gas, and sewage related uses.

9. Tax Exempt – parcels used for public purposes including government, civic, schools, and publicly owned recreation uses.

The columns in Table 10-1 show the total number of acres by land use category and distinguishes between improved, unimproved and timber (forested) properties for each category. The percentages associated with the improved, unimproved and timber columns are based on the total acreage for each land use category. The percentages in the far right column (Total) are taken from the total acreage of all land use categories combined.

Once the County determined the existing distribution of land uses in the rural areas, the zoning classification for each parcel was established. The purpose of this step was to illustrate what the land use was currently being used for (e.g., transportation, forestry) and what its potential residential use was based on its zoning. For example, if a property has an existing land use code of vacant and is located within a Rural Commercial zoning district which allows one dwelling unit per acre, the vacant parcel could have at least one dwelling unit built on it, resulting in the addition of at least 2.54 new residents (2.5 is the approximate number of people that may occupy a dwelling unit as specified by the U.S. Census). Table 10-2 below summarizes the analysis conducted for each of the land use categories based on the zoning district (not shown).

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Table 10-2. Rural Land Capacity Summary

Existing Land Use	# of Parcels	# of Existing Dwelling Units (DU)	# of Additional DU[1]	Total DU *(existing DU + additional DU)*	# of Additional Residents *(2.5 people x additional DU)*	Total Estimated Population *(2.5 people x total DU)*
Residential	18,809	18,787	543	19,340	1,358	48,350
Vacant	18,932	0	20,789	20,789	51,973	51,973
Commercial	356	0	481	481	1,203	1,203
Industrial	20	0	7	7	18	18
Aqua/Agriculture	905	0	2,523	2,523	6,308	6,308
Forestry	2,395	0	9,964	9,964	24,910	24,910
Mineral Extraction	8	0	3	3	8	8
Transportation	391	0	460	460	1,151	1,151
Utilities	219	0	358	358	895	895
Totals	**42,035**	**18,797**	**35,128**	**53,925**	**87,823**	**134,815**
Totals w/Clustering*			**37,176**	**55,973**	**92,943**	**139,935**

Note: Table values are based on Table IV.3-7A in the 2005 Mason County Comprehensive Plan.

[1]Calculated based on zoning district density or lot size allowance.

*Clustering allows certain land uses to increase the number of potential residences located on one parcel provided the development meets specific criteria in the County Code.

According to the County's analysis in 2005, rural lands had the capacity to absorb an additional 37,176 dwelling units, or approximately 92,943 people. This would be in addition to the estimated population existing at the time of the analysis (2005) of 53,884 (U.S. Census Bureau, 2011b). In other words, county rural lands had the capacity to absorb about 1.7 times the current population. However, this estimate does not take into account lands that are not suitable for residential development, such as those with wetlands or other critical areas, or area needed for supporting infrastructure, such as roadway networks and stormwater facilities.

Existing land uses were categorized as part of this Inventory and Characterization Report using 2010 Mason County Assessor's data. The land use categories developed for this report are not identical to the ones that Mason County developed for the land capacity analysis. For example, Mason County differentiated between Long Term Commercial Forest and Forestry land uses but for the purposes of this Inventory, the two categories have been collapsed as one. The difference between the two land use categories is that Long Term Commercial Forest lands have a 100-

year commitment to forestry while Forestry land uses can be converted to non-forestry land uses at any time. Also, Parks, Recreation and Open Space is a single land use category for this Inventory but not in the land capacity analysis. Examining existing land uses in the shoreline areas in light of the land capacity analysis is useful at a qualitative level to view trends in development anticipated for the shoreline.

Figure 10-3 below illustrates the existing major land uses within Mason County's freshwater shoreline areas (excluding Allyn, Belfair and Shelton UGAs and U.S. Forest Service lands) based on the Inventory and Characterization Report analysis:

Figure 10-3. Major Land Uses in Freshwater Shoreline Areas (Rural Lands)

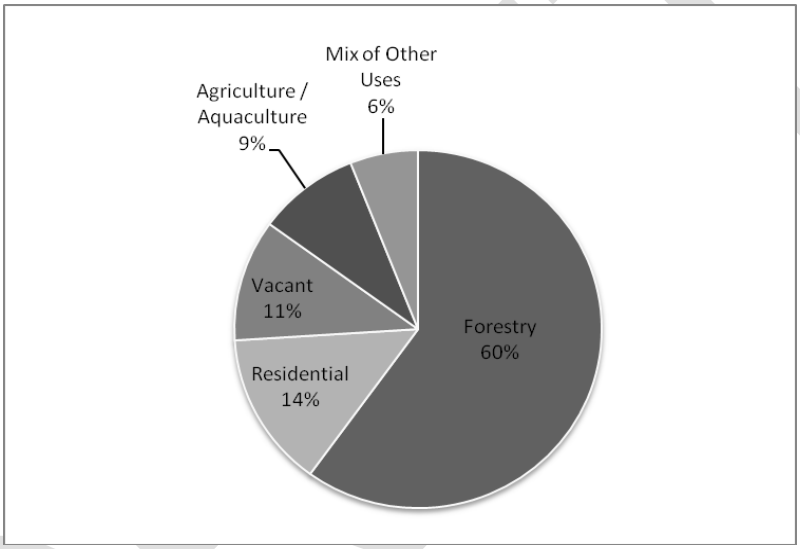
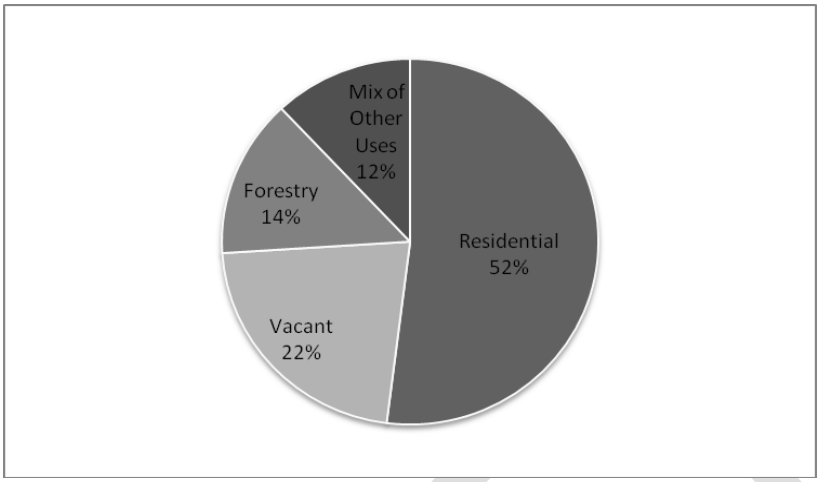


Figure 10-4 below illustrates existing major land uses within Mason County's marine shoreline areas (excluding Allyn, Belfair and Shelton UGAs and U.S. Forest Service lands) based on the Inventory and Characterization Report analysis:

Figure 10-4. Major Land Uses in Marine Shoreline Areas (Rural Lands)



According to the land capacity analysis, the vast majority of additional dwelling units would occur on lands classified as vacant. It can therefore be deduced that residential land capacity is generally higher in the marine shorelines than in the freshwater shorelines in Mason County, especially since many of the freshwater shorelines are designated forest resource lands (and therefore unavailable for residential development) or already developed and not vacant. Development that does occur in freshwater shorelines would more likely take place around lakes than along rivers, based on the historical residential development pattern and the prevalence of floodplain areas along rivers. Lakes also provide private recreational opportunities that would serve to attract additional single-family residential development. Currently, 26 percent of lake shorelines are in residential use and 11 percent of river shorelines are in residential use.

Mason County also conducted a land capacity analysis for Belfair, Allyn and Shelton UGAs. Table 10-3 shows the distribution of existing land uses within the urban growth areas according to the Mason County Assessor's data (December 2004). Land uses within Shelton's city limits are not included in the table below.

Table 10-3. Belfair, Allyn and Shelton UGA Land Use

Land Use	Belfair UGA	Allyn UGA	Shelton UGA
Residential	19%	34%	22%
Vacant	22%	26%	16%
Commercial	8%	12%	5%
Industrial	0%	0%	8%

Land Use	Belfair UGA	Allyn UGA	Shelton UGA
Agriculture/Aquaculture	1%	11%	1%
Forestry	41%	10%	27%
Mineral Extraction	0%	0%	0%
Transportation	2%	5%	13%
Utilities	3%	2%	1%
Tax Exempt	3%	1%	7%
Total	**100%**	**100%**	**100%**

Note: Percentages in table have been derived based on acreage values shown in Tables IV.3-4, IV.3-5, and IV.3-6 of the 2005 Mason County Comprehensive Plan.

The land capacity analysis for the UGAs in Mason County was conducted in a similar manner as that for the rural lands, except that the acres shown to be available for development were reduced to accommodate an assumed percentage of roadway, market demand and, in the case of Shelton's UGA, critical areas. The assumed percentages varied by UGA.

Table 10-4. Belfair, Allyn and Shelton UGAs Land Capacity Summary

UGAs	Developable Area	Number of DU	Population
Belfair	508	2,247	5,617
Allyn	270	1,061	2,243
Shelton	1,051	2,379	5,948
Total	**1,829**	**5,687**	**13,808**

Note: Table values are derived from Tables IV.3-4A, IV.3-5A, and IV.3-6A of the 2005 Mason County Comprehensive Plan.

According to the County's 2005 analysis, the UGAs have the capacity to absorb 5,687 additional dwelling units, or 13,808 people. This is in addition to the rural land's capacity to absorb 37,176 dwelling units, or approximately 92,943 people bringing the total amount of land capacity to 42,863 dwelling units, or 106,751 people (Mason County, 2005).

The Mason County Comprehensive Plan relied upon the Medium Series (or mid-range) projection provided at the time by the Office of Financial Management to plan for projected population estimates. OFM estimated that the total population for Mason County would be 64,007 by the year 2015 and 75,088 by 2025. The 2010 population according to the U.S. Census Bureau in Mason County is 60,699 (U.S. Census, 2011a).

Based on the land uses analysis prepared for the Inventory and Characterization Report (2010 Mason County Assessor's data), Figure 10-5 illustrates the majority of existing land uses in the freshwater shoreline areas of Belfair, Allyn and Shelton UGAs. Freshwater shoreline in Belfair, Allyn and Shelton UGAs is equal to about 8 linear miles, most of which is located in Shelton.

Figure 10-5. Major Land Uses in Freshwater Shoreline Areas (UGAs)

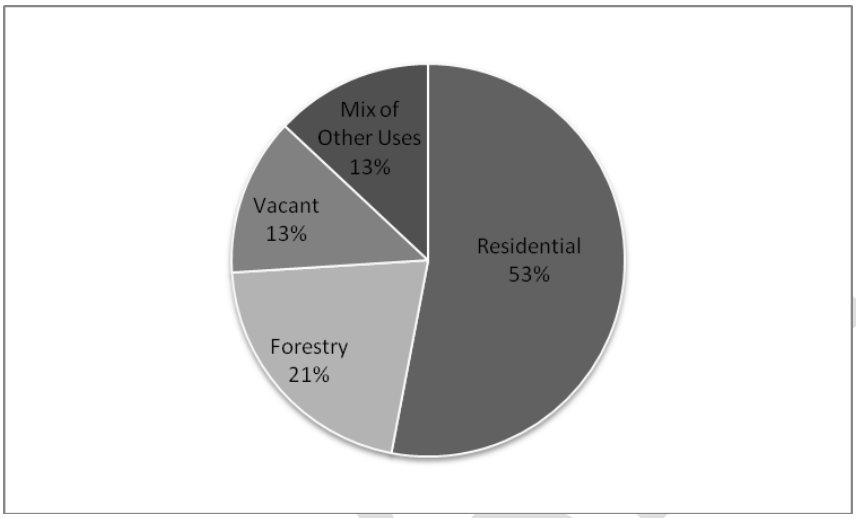
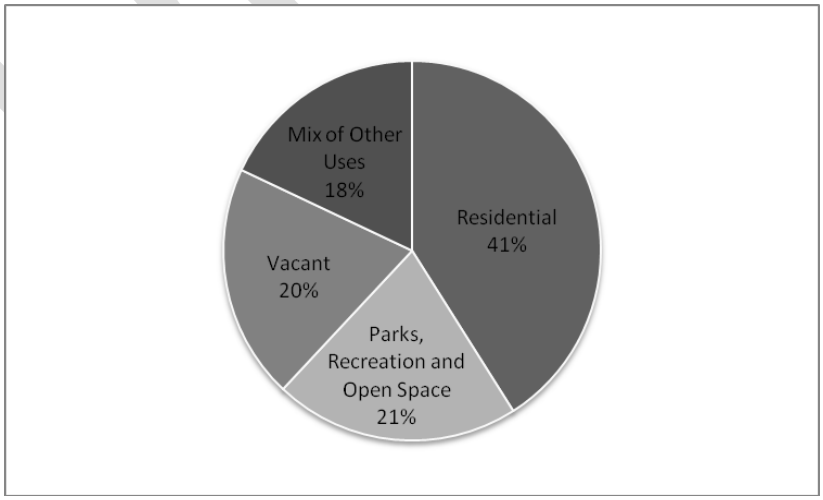


Figure 10-6 illustrates the majority of existing land uses in the marine shoreline areas of Allyn and Shelton UGAs (Belfair UGA limits are not adjacent to the marine shoreline) based on the Inventory and Characterization Report analysis. Marine shoreline in Allyn and Shelton UGAs is equal to about 2 linear miles, most of which is located along Allyn.

Figure 10-6. Major Land Uses in Marine Shoreline Areas (UGAs)



It is not clear from the land capacity analysis documented in the Mason County Comprehensive Plan which land use category in the UGAs would have the largest capacity to absorb additional dwelling units since the analysis was organized by zoning district. However, it is likely that the vacant lands would have the most potential to absorb new development.

Population Growth and Wastewater Treatment Facilities

Existing wastewater treatment facilities in Mason County are predominately comprised of individual treatment systems such as septic tanks and drainfields.

The County owns and operates small sewer systems for the Rustlewood and Beard's Cove communities. There is no planned expansion beyond the existing platted lots. These systems currently provide services to approximately 1,200 customers, with the potential to serve an additional 100. The County also operates a medium-sized wastewater collection system and treatment plant for the North Bay Case Inlet area. This area was defined based on studies that revealed the areas contributing human sewage contamination to Case Inlet. The North Bay Case Inlet system provides service to approximately 950 customers, with additional capacity to serve an estimated 850 additional equivalent residential units within the existing service area (Mason County, 2005).

A Membrane BioReactor plant currently under construction will treat sewage from more developed areas of the Belfair UGA to Class A reclaimed status (water that meets State Class A Reclaimed Water criteria per state standards, as established under the Reclaimed Water Act). Future sewer extensions and plant upgrades are expected to provide service to the entire Belfair UGA by 2025 (Mason County Wastewater, 2011).

Centralized sewer systems are defined as an urban service under the Growth Management Act, and are not allowed outside urban growth areas unless they are necessary to protect public health and the environment. To address water quality problems, Mason County, along with partners including the Skokomish Tribe and Washington State Parks, are in various stages of planning and building wastewater treatment plants for Hoodsport, Potlatch, and the densest part of the Skokomish Indian Reservation. Finding economically viable solutions for wastewater treatment in these and other unincorporated but relatively densely populated rural communities has been an ongoing challenge in Mason County (Mason County, 2005).

Since 2007, the Squaxin Tribe has used a biomembrane bioreactor to place the entire Squaxin Island Indian Reservation at Kamilche on 100% water reclamation.

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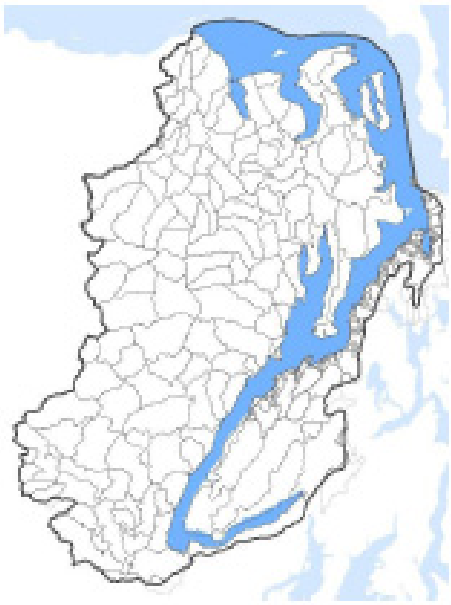
Impervious Surface Buildout in Hood Canal

In 2008, the Hood Canal Coordinating Council (HCCC) conducted an impervious buildout analysis that quantified the amount of additional impervious surface that could potentially be built as allowed by the applicable zoning district. The study area for the analysis is equivalent to the summer chum evolutionarily significant unit (ESU), outlined in bold black in the figure below (Figure 10-7). The study area was split into smaller basin-sized polygons so that information could be grouped into hydrographically relevant zones (Peterson GIS, 2009). The southern portion of the study area is located in Mason County.

Figure 10-7. HCCC Study Area



The HCCC conducted this analysis at a parcel level. Current land use, housing density (if any), future land use (based on existing land use, parcel size, and zone) and zoning allowances and restrictions were considered when assigning each parcel an appropriate buildout impervious surface amount. The approximate amount of impervious surface associated with a land use group (both current and future) comes from an average of impervious surfaces within all parcels of that land use group. Residential, commercial and industrial land uses were all quantified using this approach (Peterson GIS, 2006; Hood Canal Coordinating Council, 2011). The intent of the data is to be used at the basin or riparian scale and compared across a broad region (Hood Canal Coordinating Council, 2011).

In order to evaluate the findings of the impervious surface buildout study relative to the Mason County shoreline planning areas, Tables 10-5 through 10-8 below were

developed to show buildout impervious values within the shoreline planning areas of freshwater and marine shorelines. The tables are organized by WRIA and marine waterbodies. Shorelines planning areas that were included in the buildout study are listed in alphabetical order under each corresponding WRIA. The impervious surface categories (0-5%, 5-10%, 10-25%, and 25%-52%) refer to the potential amount a property would be developed with impervious material. The percentages listed for each shoreline area are based on the amount of properties that would potentially develop according to each category.

Table 10-5. WRIA 14b Impervious Surface Buildout Potential by Shoreline Area

WRIA 14 - Kennedy-Goldsborough Shoreline Areas	Impervious Surface Categories			
	0 to 5%	5 to 10%	10 to 25%	25 to 52%
Coon Lake	40%	60%	0%	0%
Devereaux Lake	4%	32%	1%	62%
Trails End Lake	41%	1%	45%	14%

Under a full buildout scenario, Devereaux Lake would have the highest percentage of impervious surface coverage. Sixty-two (62) percent of the properties in the lake's shoreline planning area would be developed with 25 to 52 percent impervious material. About 40 percent of Coon Lake and Trails End Lake would be developed with minimal amounts of impervious surface coverage (0-5 percent).

Table 10-6. WRIA 15 Impervious Surface Buildout Potential by Shoreline Area

WRIA 15 - Kitsap Shoreline Areas	Impervious Surface Categories			
	0 to 5%	5 to 10%	10 to 25%	25 to 52%
Blacksmith Lake	74%	4%	22%	0%
Dewatto River	95%	3%	0%	2%
Erdman Lake	54%	23%	23%	0%
Goat Ranch Lake	100%	0%	0%	0%
Haven Lake	62%	1%	21%	17%
Lake Bennettsen	68%	0%	0%	32%
Lake Wooten	67%	2%	27%	4%
Maggie Lake	43%	6%	30%	22%
Mission Creek	47%	22%	24%	7%
Panther Lake	83%	0%	17%	0%

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WRIA 15 - Kitsap Shoreline Areas	Impervious Surface Categories			
	0 to 5%	5 to 10%	10 to 25%	25 to 52%
Rendsland Creek	63%	36%	1%	0%
Section One Pond	100%	0%	0%	0%
Tahuya River	58%	34%	7%	1%
Tee Lake	48%	10%	39%	3%
Tiger Lake	71%	2%	25%	3%
Twin Lakes	100%	0%	0%	0%
Union River	31%	43%	23%	3%
Unnamed Lake - Elfendahl Pass	92%	0%	0%	8%

The majority of shoreline planning areas located in WRIA 15 are likely to have minimal impervious surface development, under the full buildout scenario. All of Goat Ranch Lake, Section One Pond, and Twin Lakes would be developed with 0 to 5 percent of impervious surfaces. Most of the remaining shoreline planning areas would be similarly developed for more than half of the shoreline properties. More intensely developed properties are likely to occur along Haven Lake, Lake Bennettsen, and Maggie Lake.

Table 10-7. WRIA 16 Impervious Surface Buildout Potential by Shoreline Area

WRIA 16 - Skokomish-Dosewallips Shoreline Areas	Impervious Surface Categories			
	0 to 5%	5 to 10%	10 to 25%	25 to 52%
Aristine Creek	100%	0%	0%	0%
Big Creek	89%	11%	0%	0%
Frigid Creek	100%	0%	0%	0%
Hamma Hamma River	95%	5%	0%	0%
Jefferson Creek	100%	0%	0%	0%
Lake Cushman	89%	5%	4%	1%
Lake Kokanee	77%	2%	9%	11%
Lilliwaup Creek	97%	0%	2%	1%
Lilliwaup Swamp	100%	0%	0%	0%
McTaggert Creek	100%	0%	0%	0%
Melbourne Lake	96%	4%	0%	0%
N. F. Skokomish River	99%	0%	0%	1%
Price Lake	100%	0%	0%	0%

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WRIA 16 - Skokomish-Dosewallips Shoreline Areas	Impervious Surface Categories			
	0 to 5%	5 to 10%	10 to 25%	25 to 52%
Price Lake Outlet	100%	0%	0%	0%
S.F. Skokomish River	53%	39%	6%	1%
Skokomish River	70%	22%	4%	3%
Vance Creek	52%	45%	2%	1%
Waketickeh Creek	98%	1%	0%	1%

Shoreline properties along the majority of waterbodies in WRIA 16 are likely to be developed with 0 to 5 percent impervious surface, under the full buildout scenario. South Fork Skokomish River, Skokomish River and Vance Creek would have some properties developed with 5 to 10 percent impervious surfaces. Of all the shoreline planning areas studied in WRIA 16, Lake Kokanee has the highest amount of properties that would develop with 25 to 52 percent impervious materials.

Table 10-8. Impervious Surface Buildout Potential in Hood Canal Shoreline Areas

Hood Canal Marine Reach	Impervious Surface Categories			
	0 to 5%	5 to 10%	10 to 25%	25 to 52%
Marine Reach 01	44.5%	23.6%	20.8%	11.2%
Marine Reach 02	55.7%	24.7%	14.3%	5.3%
Marine Reach 03	46.2%	12.4%	12.0%	29.4%
Marine Reach 04	34.0%	22.5%	17.3%	26.3%
Marine Reach 05	42.1%	11.1%	16.1%	30.8%
Marine Reach 06	99.6%	0.4%	0.0%	0.0%
Marine Reach 07	28.6%	19.0%	33.3%	19.1%
Marine Reach 08	27.5%	13.6%	43.7%	15.2%
Marine Reach 09	51.0%	28.1%	12.7%	8.2%
Marine Reach 10	24.1%	23.7%	38.6%	13.6%
Marine Reach 11	51.3%	18.8%	19.9%	10.0%
Marine Reach 12	56.1%	22.5%	14.4%	7.0%
Marine Reach 13	63.3%	31.2%	5.5%	0.1%

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Under a full buildout scenario, Marine Reaches 3, 4 and 5 (generally between Hamma Hamma River stream mouth and Hoodsport) would have the highest percentage of impervious surface coverage. The remaining marine reaches would have a variety of developed properties, ranging between 0 and 52 percent impervious. Marine Reach 6 (near Skokomish Tribe Reservation) would have the least amount of impervious surface.

Water-use Demand at Buildout and Stream Flow Impacts

In 2009, Aspect Consulting prepared a report titled *River and Stream Impairment Analysis, WRIA 16 and 14b, Skokomish-Dosewallips Planning Area* that estimates the potential consumptive water use in WRIA 16 and 14b under a full buildout scenario. Similar to the HCCC analysis, the buildout analysis documented in this report is based on the assumption that properties would fully develop as allowed under the existing zoning districts. Full buildout water use for WRIA 16 and 14b is estimated at approximately 12,500 acres-feet/year (afy). Total current (2008) water withdrawals in the WRIA 16/14b study area is estimated to be at 2,300 afy. Irrigation withdrawals is estimated at about 280 afy or 12 percent of the total.

The report also evaluated stream impairment as a result of increased water use under the full buildout scenario. Six subbasins in WRIA 16 and 14b were examined to determine the potential impact of full buildout on streams and stream habitat. The following are the findings for subbasins within Mason County:

1. **Hamma Hamma Subbasin**: Total withdrawals in the Hamma Hamma subbasin are estimated to increase from 184 afy for 2008 to 1,400 afy at full buildout. At greater than a seven fold increase, this is the largest increase in water use from 2008 to full buildout on a percentage basis for the study area subbasins. Shoreline waterbodies that are ranked with a high potential for overall stream impairment are Waketickeh Creek, the lower Hamma Hamma River, and Johns Creek.
2. **Finch/Lilliwaup Subbasin**: Total groundwater withdrawals for 2008 in Finch/Lilliwaup subbasin are estimated to increase from 334 afy to 1,465 afy at full buildout. Lower Lilliwaup is the only shoreline waterbody in the subbasin that is ranked with a high potential for overall stream impairment.
3. **Skokomish Subbasin:** Total withdrawals in the Skokomish subbasin for 2008 are estimated at 835 afy with an increase to 5,400 afy at full buildout. The increase is the greatest projected water use increase for any of the subbasins and is a result of the large amounts of agriculturally zoned land. Shoreline waterbodies that are ranked with a high potential for overall stream impairment are Vance Creek and the lower Skokomish River.

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4. **South Shore:** Total 2008 withdrawals for the South Shore subbasin are estimated at 574 afy and will likely increase to 2,673 afy at full buildout. This is the second greatest projected water use increase of the study area subbasins. All streams in the subbasin were ranked with a high potential for stream impairment. None of the streams within **the South Shore** area are shorelines of the state, although several shoreline lakes (i.e., Devereaux, Coon and Trails End) serve as the headwaters for a few of the streams.

The following figure (Figure 10-8) shows the subbasin and county boundaries.

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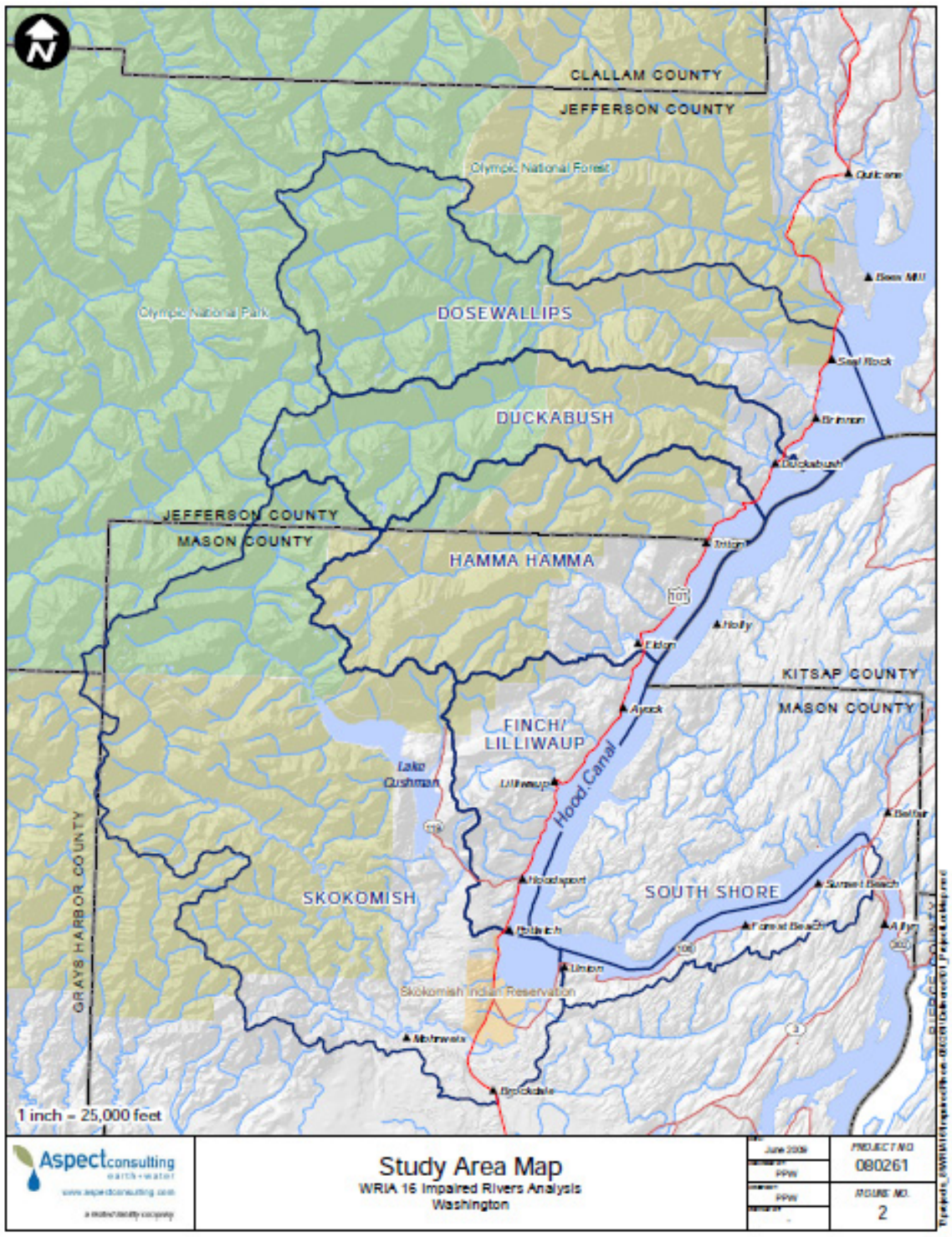
Figure 10-8. Study Area Map



Source: Aspect Consulting, 2009

10.2.2 Demand for Water-dependent Uses

The demand for water-dependent uses in Mason County includes recreation and public access, marina developments, ferries and ferry landings, port facilities and other industrial water-dependent uses, and aquaculture, primarily commercial shellfish.

There are many water-dependent or water-oriented recreation sites in Mason County that currently provide use and public access to the shoreline. Mason County, Mason County ports, Washington State Parks, and Washington State Department of Natural Resources manage parks, campsites, boat launches, and trails that provide public access to shorelines. Public boat launch facilities managed by the Washington Department of Fish and Wildlife provide access to numerous lakes. The Squaxin Island Tribe provides a public boat launch site in the marine environment. Further, the US Forest Service provides campgrounds and public access to rivers in the Olympic National Forest. In addition to public recreation sites, there are many private docks and piers associated with residential development on lakes and portions of the marine shoreline. Private marinas are generally limited in number but can be found in the marine environment.

Many of the small inlets and bays within the marine waters of Mason County are likely too shallow to support development as new public or private marinas. The inlets and bays in Mason County do not appear to provide water depths necessary to accommodate larger boats and be considered viable for marina development. Shallow bays are found in Hood Canal, Case Inlet, Harstene Island, Oakland Bay, Totten Inlet and areas in South Puget Sound. Therefore, the bathymetry (water depth) of Mason County marine shorelines plays a role in limiting the potential location of new marinas or ferry facilities. Water-dependent transportation facilities are limited to bridges that connect islands to the mainland. There are no ferry terminal facilities in Mason County.

There are very few water-dependent industrial and commercial uses in the county (see aquaculture discussion below). John's Prairie Industrial Park is a major industrial center located on Port of Shelton property near John's Creek in Shelton's UGA. The industrial park hosts a variety of tenants, none of which are water-dependent or water-related. Mason County has 6 port districts (Port of Allyn, Port of Dewatto, Port of Grapeview, Port of Hoodsport, Port of Shelton, and Port of Tahuya). Other than Shelton, ports in the County are small and manage recreational facilities such as boat launches and docks.

Cargo activity is prevalent in Hammersley Inlet in association with Shelton's Harbor. Although the City of Shelton is not included as part of this report, cargo activity occurs in marine waters outside Shelton city limits. In 2009, 468,289 short tons

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(2,000 pounds equals one short ton) of domestic shipments occurred along the Hammersley Inlet waterway. In addition, 7,742 short tons of domestic shipments were received. The shipments were composed of wood chips, rough wood, and sand and gravel. There were 470 total trips made, 231 upbound and 239 downbound. Most trips were made with self-propelled towboats and non-self propelled dry cargo vessels (U.S. Army Corps of Engineers, 2009).

The Port of Allyn has established primary goals for the Port that relate to increasing water-dependent recreational development and water-related commercial businesses (Port of Allyn, 2011):

1. **Goal 2: Saltwater Access & Harbor Improvements.** Objective: Acquisition of salt water access on Hood Canal and Case Inlet to improve recreational and tourist opportunities - Build kayak `take outs' and other such structures to improve and increase non-motorized water craft activity.

2. **Goal 5: Tourism.** Objectives: Increase opportunities for public access to saltwater throughout the Port District; Seek opportunities for small and/or seasonal businesses that support waterfront activities to locate in Allyn.

Mason County also has numerous commercial aquaculture sites in the marine environment. Shellfish harvesting has been a significant resource in the County. Large cultivators include Taylor Shellfish, an international shellfish wholesaler that has been operating in South Puget Sound for over 100 years (Cascade Land Conservancy, undated). Taylor Shellfish is ranked as the 3rd highest private employer in the County, employing approximately 400 people (Mason County Journal, 2008). Taylor Shellfish harvests a wide variety of shellfish, including oysters, clams and geoducks. There are a number of other smaller shellfish growers that also harvest a variety of shellfish. The Skokomish Tribe and Squaxin Island Tribe also have aquaculture facilities. There are 14 shellfish growers that are leasing lands from the Department of Natural Resources. The shellfish being harvested by these growers include: mussels, oysters, and clams. Lands being leased are located in Totten Inlet, Pickering Passage, Oakland Bay, Case Inlet, near Dewatto stream mouth, Hammersley Inlet, Skookum Inlet, North Bay and near Hamma Hamma stream mouth (see Map 19).

According to the Washington State Shellfish Aquaculture Regulatory Committee's report on geoduck aquatic operations, there is an increasing demand for aquaculture, specifically geoduck farming, in the intertidal zones of Puget Sound. The report states:

> *In recent years domestic and international demand for geoducks has increased dramatically. Wild geoducks are commercially harvested by divers. Over the last decade shellfish growers have developed aquaculture techniques to grow*

> *geoduck clams in the intertidal zone. The most common method involves inserting plastic tubes into the beach at low tide, planting cultured geoduck seed in the tubes, and covering the tubes with netting. The tubes and nets protect the baby clams from predators. After the geoducks grow for one to one and a half years, the tubes and nets are removed. When the geoduck clams reach market size, usually after four to six years, they are harvested by workers using water jets to loosen the sediment surrounding the clams so they can be removed. Planting, maintenance of the tubes and nets and harvest usually occur during low tides when the area where the clams are planted is exposed. In certain times of the year the low tides occur at night. (Ecology, 2009)*

The demand for new commercial shellfish areas is anticipated to continue to increase. According to the Mason County Comprehensive Plan, the aquaculture industry has experienced sustained growth over the past 10-15 years with sales rising nearly tenfold since the late 1980s (Mason County, 2005).

10.2.3 Parks and Recreation

Mason County adopted an update to the Mason County Parks and Recreation Comprehensive Plan in November 2006 (Mason County Department of Parks and Trails, 2006). Development of the plan included an extensive public process, including the distribution of 15,000 copies of a park survey, visits to community groups by County staff, and public meetings. Chapter 6 of the adopted plan describes park needs by establishing level-of service standards based on:

- Comparisons with other county's Level of Service standards.
- Creation of a Parks Advisory Committee.
- Results of a countywide citizen survey.
- Park usage information.
- Public input and miscellaneous factors.

Results of the countywide survey indicate that respondents had a strong desire for water access activities, such as fishing, swimming, boating, and kayaking. Based on the survey results, the top priority for park funding should go into waterfront parks to improve water access. The second rated priority was to develop walking/bicycle trails and bike routes. Chapter 7 describes strategies to meet recreational needs. Potential projects that would provide or improve water access at specific locations include:

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- Acquisition of Harvey Rendsland Park from Washington State Parks.
- Possible future park development near Star Lake, Lost Lake, Lake Nahwatzel, or Cloquallum Road. A park that provides swimming access is identified in the Plan as being the most beneficial.
- Acquire 2-acre parcel adjacent to Latimer's Landing to enhance and improve the existing boat launch.
- Development of Oakland Bay park to provide passive recreation.
- Purchase of Lake Isabella State Park from Washington State Parks.
- Sale of Mason Lake Picnic Park since it is too small to be developed into a park and does not have sufficient parking.
- Children's play area could be added to Jacoby Park, Latimer's Landing, and Mason Lake Park.

Based on the GIS dataset from Ecology's Shoreline Public Access Project (2008), the potential for new park opportunities and public access appears to be most prevalent within the marine shoreline due to the existence of publicly-owned lands.

Increasing public access to existing parks through park expansion or added recreational facilities may cause strain on existing on-site wastewater treatment facilities. For example, the Belfair State Park experienced a sewer overflow in 2007 and the problem has since been repaired. The capacity of existing wastewater treatment facilities will need to be taken into consideration when addressing the potential increase in recreational demand.

WRIA 16 Watershed Planning Unit in coordination with WDFW has identified a list of recreational sites in need of sanitary facilities. The recreational sites have been classified into four tiers, with Tier 1 having the highest priority. Highest priority sites that are located within Mason County include: Purdy Cut-Off Road/Highway 106/Skokomish River; Menard's Landing (Rendsland Creek) County Park; and West Dewatto (WRIA 16 Watershed Planning Unit, Undated).

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10.3 Potential Use Conflicts

10.3.1 Agricultural Uses

Conflicts may exist in Mason County between agricultural uses, other adjacent uses and environmental protection. Conflicts typically associated with agricultural uses include water quality degradation due to nutrient loading to streams and lakes. Sources of nutrients are livestock waste and fertilizers. Conflicts also occur from livestock physically accessing stream channels, which leads to streambank erosion and increased turbidity. In addition to conflicts with environmental conservation, agricultural uses have the potential to conflict with residential and recreational uses because of noise, odors and the hour of operations. Another potential conflict is between county policies and land use designations adopted under the Growth Management Act to preserve agricultural land for productive use, and proposed conversion of agricultural lands for habitat restoration.

Because agricultural uses generally do not create impervious areas, agricultural lands can provide an overall benefit in watershed processes, such as water retention and detention. Greater concentrations of agriculture around SMA waterbodies are found in the Skokomish River, Gosnell Creek and Skookum Creek areas.

10.3.2 Flood Management and Habitat Restoration

Conflicts may exist in Mason County along shorelines where structural flood control measures are utilized. While these measures protect structures and uses from flooding, they also result in a disconnection of the river from its floodplain, which can have adverse impacts on hydrology and fish habitat. Structural flood control measures have been used in several SMA waterbodies including the Skokomish River, Goldsborough Creek, and Tahuya River.

Conflicts also exist along shorelines which are regulated by various state and federal agencies with different mandates related to flood management and habitat restoration. For example, relocating flood control structures further upland from the edges of rivers can address multiple flood management and habitat goals, such as reestablishing floodplain wetlands and side channels. On the other hand maintaining existing flood control structures can conflict with ecological protection/restoration. An example of this conflict is the U.S. Army Corps of Engineers requirements and guidelines for levee maintenance, which discourage tree growth on levees so as not to compromise the structures for flood certification.

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10.3.3 Forest Practices

Forest resource lands cover a majority of the county. Forestry activities in Washington are regulated by the Forest Practices Act (RCW 76.09) and implementing rules (WAC 222.08). Recently, mitigation measures have been incorporated to address forest practice impacts to watershed functions. The forest practices rules require a riparian management zone (RMZ) around all streams, where timber harvests are more closely regulated (WAC 222.30.020). The RMZ is composed of three concentric buffers, each with specific management rules. Timber harvest is only prohibited in the inner ring, which is generally 50 feet, even though the SMA jurisdiction is a minimum of 200 feet.

The long-term maintenance of timber harvest roads and culvert crossings has an effect on downstream waters and water quality in shorelines of the state. Timber harvest roads can contribute sediment to downstream waters and can be associated with landslides, erosion and slope failures. Decommissioning forest roads when under-utilized is one way to restore upper watershed processes and reduce sediment loading to improve water quality. For example, the US Forest Service is actively decommissioning out of service forest roads in WRIA 16. Decommissioning of timber roads can be in conflict with public access to forest lands.

Under SMP guidelines (WAC 173-26-241(3)(e), local SMPs are to rely on the Forest Practices Act and its rules for the regulation of commercial forest uses within shoreline jurisdiction. However, within shorelines of statewide significance, the SMA allows only selective commercial timber cutting in which no more than 30 percent of the trees are removed in any 10-year period (RCW 90.50.150).

Where land use is converted to non-forestry uses, the SMP would apply. Conversions of forest lands can create use conflicts with surrounding long-term commercial forestry operations.

10.3.4 Log Booming and Storage

The placement and removal of logs and log bundles in marine waters have the potential to affect juvenile salmonid migration, natural sediment movement, shading of the nearshore environment, and water quality and habitat impacts resulting from wood waste. However, log booming and storage is a water-dependent use, a preferred use under the SMA. Existing log booming activity is found in and around Shelton Harbor affiliated with the mills located there.

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10.3.5 Outfalls

Installation of outfalls in riparian buffers may be a potential use conflict in Mason County. Although sanitary sewer utilities are not likely to be located in the shoreline since Mason County is pursuing land application of treated wastewater for new facilities, new stormwater outfalls may occur in the shoreline. Such utilities tend to locate within shoreline areas either as outfalls discharging stormwater or as utility crossings. Establishing utility facilities is often in conflict with protecting riparian vegetation. Stormwater may affect water quality and water quantity and could result in streambank erosion.

10.3.6 Overwater structures

Development of overwater structures such as piers, docks, covered moorage, floating homes, mooring buoys, marinas, shipyards and terminals, boat lifts, and boat ramps and rails has the potential for conflicts with other shoreline uses. Areas in which these conflicts may occur include freshwater lakes and saltwater shorelines in Mason County, particularly those in WRIA 14 and 16. Public piers and docks and boat ramps provide public access and recreation for shoreline users, a major policy objective of the SMA. Private docks and boat lifts associated with residential development are typically allowed, and are considered exempt from obtaining a shoreline permit under certain conditions (WAC 173-27-040(h)). Large concentrations of piers and docks can create conflicts with other uses by limiting potential for recreation and restoration and potentially interfering with navigation. Marinas with covered moorage also may have impact on shoreline views of adjacent shoreline users.

10.3.7 Permit Exemptions and Cumulative Impacts

A number of uses and activities are designated by the SMA as being exempt from the requirement to obtain a Shoreline Substantial Development Permit (WAC 173-27-040), but nonetheless have direct or cumulative adverse impacts to shoreline ecological functions. These uses and activities are considered "exempt" from permitting, but are not exempt from meeting the goals and intent of the SMA.

For example, single-family residential use is treated as a priority use under the SMA. Homes and bulkheads built above the ordinary high water mark are exempt from permitting. Cumulatively, residential development in shorelines increases impervious surfaces and, if unmitigated, contributes to an overall decline in shoreline functions. The cumulative effects of bulkheads and other types of hard armoring are also known to impact shoreline habitat (WAC 173-26-231(3)(a)(ii)). Note that even activities exempt from substantial development permit requirement

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must still be reviewed for consistency with the SMP as part of other permit processes (e.g., county building permit; Hydraulic Project Approval, etc.), and in some cases may need a Conditional Use or Variance permit.

The Puget Sound Partnership Action Agenda (Puget Sound Partnership 2009) has a strategy for cleaning up, restoring, and protecting Puget Sound by 2020. The Action Agenda outlines the current health of Puget Sound, identifies threats to a healthy Sound, and identifies priorities and strategies for meeting the goal of restoring Puget Sound by 2020. The Action Agenda notes that alteration of nearshore habitat through the localized construction of single-family bulkheads and docks, in a cumulative fashion, can threaten broad components of the Puget Sound ecosystem. Therefore, exemptions for single-family residential development, bulkheads and docks should be examined to make certain that cumulative impacts do not occur.

Another exemption outlined in WAC (173-27-040) covers repair and maintenance of existing public utilities and facilities. Similar to other exemptions which are defined in state law, the repair and maintenance of utilities and facilities is to be "construed narrowly" meaning that the repair or maintenance must only replace the existing use or facility within the same location, size and configuration.

Many of the county's shorelines, particularly marine areas, are served by existing roads and utilities. In order to promote efficient and timely repair of damage to these structures, the repairs and maintenance for transportation infrastructure and public utilities, when meeting the definition for repair in the WAC, should be maintained as exempt activities. The exemption would need to demonstrate that potential environmental damage has been minimized and sufficiently mitigated; thereby meeting the goals and intent of the updated shoreline master program.

10.3.8 Shellfish Aquaculture

Aquaculture, particularly shellfish growing and harvesting, is considered a preferred use under the SMA as a water-dependent use. In addition, Ecology's SMP guidelines consider commercial and recreational shellfish beds "critical saltwater habitat" that should be afforded higher levels of protection from other uses that can impact water quality and substrate composition (WAC 173-26-221(2)(c)(iii)). Shellfish beds perform a number of important ecological functions including cycling nutrients, stabilizing substrates, creating habitat structure (e.g., oyster reefs), enhancing water quality (filtering and retention), and providing food for a wide variety of marine invertebrates, birds, fish, and mammals. Many other shoreline uses have the potential to adversely affect shellfish aquaculture. Any use or activity that degrades water quality or alters substrates in the nearshore has potential to impact native shellfish stocks and commercial aquaculture. Examples include use of pesticides and fertilizer on upland areas; marinas with potential for fuel spills; and shoreline

modifications (e.g., bulkheads, breakwaters, and over-water structures) that can alter substrate composition by cutting off sediment supply or altering natural erosion and accretion processes.

While many shoreline uses can adversely affect aquaculture, commercial shellfish harvesting itself can potentially impact adjacent shoreline uses. Intertidal aquaculture operations can potentially create use conflict between shellfish farming and public access in the shoreline. Unlike recreational harvest of native shellfish, aquaculture requires the use of small equipment within the intertidal zone, including plastic tubes, nets and other devices that may temporarily inhibit public access and recreational uses. Washington State Parks has identified a potential conflict with mooring buoys and shellfish growers. When Washington State Parks seeks to install mooring buoys, they only do so when it is found not to conflict with a shellfish grower's ability to harvest shellfish.

There is also growing public and scientific interest in the Puget Sound region in the possible ecological effects of expanding aquaculture operations, specifically geoduck aquaculture. A large-scale multi-disciplinary study is currently underway, with researchers addressing many of the most pressing issues related to the effects of geoduck aquaculture on the Puget Sound ecosystem. Participants in the research include local university marine scientists from the University of Washington, state agencies, and researchers from local shellfish growers. For example, Washington Sea Grant (WSG) operating out of the University of Washington College of Ocean and Fishery Sciences has embarked on a Geoduck Aquaculture Research Program. This program is supported by the Washington geoduck aquaculture research account and aims to address the specific research priorities stated in SSHB220 2007-08 (see web site at: http://www.wsg.washington.edu/research/geoduck/index.html). A comprehensive literature review, which summarized the data gaps and pinpointed areas of future research needed, was prepared for WSG by Straus and others (Straus et al., 2008).

Projects supported by WSG in the 2007-2009 biennium were selected through a scientific peer-review process. Research is underway related to the effects of geoduck aquaculture on: eelgrass, sediment characteristics in the intertidal zone, native benthic species, and other ecological systems in the shoreline. The possible effects, including cumulative effects, of current geoduck aquaculture practices on the Puget Sound ecosystem are currently being studied.

In 2007, the Washington State Legislature directed Ecology to adopt new guidelines to address potential use conflicts resulting from commercial geoduck aquaculture in shoreline areas. Ecology's final guidelines, adopted with advice from a Shellfish Aquaculture Regulatory Committee, include the following (Ecology, 2011b):

- Requirement for local governments to better review water quality, contaminated sediment and other shellfish-related data and information during the local shoreline master program update process.
- Underscore existing requirements for local governments to have shoreline master program policies, regulations, and standards that address aquaculture
- Requirement that all new commercial geoduck aquaculture project applications obtain a conditional use permit.
- Requirement for new commercial geoduck aquaculture project applications to meet the mitigation sequence of first avoiding and then mitigating for environmental impacts.
- Requirement to address the impacts from noise, lights, vehicles, gear and other aspects of commercial geoduck siting and operations.
- Requirement for local governments to notify the public and tribes regarding proposed commercial geoduck aquaculture projects.

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