

PART III

Physical Description

Physical Regions of Washington

On the basis of surface features, Washington may be divided into eight general regions. Agricultural settlement is influenced by factors of topography, climate, soil, forest vegetation and water resources distinctive to each of the physiographic regions. Each has become a different type of farming area as settlers have learned to adapt crops and livestock to the conditions, or have improved limitations through drainage or irrigation.

Coastal Plains

A narrow, sandy plain with shallow bays, tidal flats, stream deltas and low headlands lies between the coastline and the Coast Range. It extends from the Columbia River mouth almost to Cape Flattery, being widest and lowest in the Grays Harbor and Willapa Bay districts. The climate is mild and damp with a long growing season, but it is too cool, cloudy and wet for most crops. Originally this area was covered with heavy forests and much is now covered with woodlands. Lumbering and manufacture of wood products is the main industry. Farming is largely of the livestock and dairying type on low uplands and drained areas in the lower Chehalis River Valley. Cranberry growing is important and well-adapted to numerous, boggy areas in the Grays Harbor and Willapa Bay sections. The shallow bays are also used for oyster culture. Fishing is common in the rivers and coastal banks.

Coast Range

The Coast Range is an uplifted area of sedimentary and metamorphic rocks divided into the Olympic Mountains and the Willapa Hills. The Olympics tower to nearly 8,000 feet in a dome-like structure, carved deeply by rivers. These mountains have the heaviest precipitation in the state. Snowfields and heavy forest cover the mountains. Most of the wilderness area is within the Olympic National Forest and Olympic National Park, being managed for recreation, wildlife and timber. Farm settlement is limited to some foothill river plains and coastal terraces such as the Dungeness and Port Angeles districts along the Strait of Juan De Fuca. Here in the lee of the mountains, rainfall is moderate and irrigation is practiced by some livestock farmers. The Willapa Hill country is wet, heavily forested and carved into numerous narrow valleys. Logging is the main industry, combined with livestock farming in the upper Chehalis River Valley and along the banks of the Columbia River. Wet climate, hilly topography and the difficulty of clearing stump land retards agriculture.

Willamette-Puget Sound Lowland

A broad lowland, described as a trough or valley, lies between the Coast Range and the Cascade Mountains. The northern part is the Puget Sound Lowland which has been glaciated and occupied by the sea in the lowest section. The continental glacier reached slightly south of Olympia. Under a warming climate it melted and geologists believe it receded about 25,000 years ago, leaving an infertile plain of moraines and outwash gravels, sands and clays known today

as the Puget Glacial Drift Plain. Its rolling surface has numerous lakes and bogs. Most of the major cities--Seattle, Tacoma, Everett, Bellingham and Olympia--have been built on moraines bordering the Sound. Rivers, such as the Nooksack, Skagit, Snoqualmie, White and Puyallup, built up deltas and flood plains over the older gravelly plains. These narrow valleys are more fertile than the older glacial plains and support numerous small dairy, vegetable and berry farms. Most of the gravelly areas are wooded with a second-growth forest and are used for pastures. In the southern part of the Willamette-Puget Sound Lowland, there are two large valleys--the Cowlitz and Chehalis. They drain a low, hilly area with several flat prairies and bottom lands.

Agriculture is handicapped by poor drainage and flooding of the river deltas and plains, by heavy winter rainfall, by cloudy but dry summers, by coarse, gravelly upland soils and by densely wooded land which is costly to clear. Advantages are mild climate and a location close to major markets for farm products such as milk, poultry and vegetables.

Cascade Mountains

The Cascades are a wide and high topographic and climatic barrier which separates western and eastern Washington. The range is made up of sedimentary, igneous and metamorphic rocks which have been carved by glaciers and streams. High, isolated volcanic cones of lava such as Mt. Adams (12,307 feet), Mt. Rainier (14,408 feet) and Mt. Baker (10,791 feet) appear upon the older Cascade rocks. The Cascade crest varies between 3,000 and 10,000 feet and is higher and more rugged in northern Washington. Roads and railroads have been built across its lower passes in central and southern Washington. The Columbia River has cut a deep gorge and the lowest pass through the barrier. The western slope is wet and heavily forested with Douglas fir. The eastern slope is drier with a less-dense pine forest. Nearly all classified as forest land, most of the area is in Federal ownership in five national forests and Mount Rainier National Park. Tree fruit farming in the eastern slope valleys of Wenatchee, Chelan, Methow, Naches and the Columbia Gorge is most important. Sheep and cattle summer grazing on alpine grasslands is another use. Deep western slope valley bottoms such as the Skagit, Snoqualmie, Nisqually, Cowlitz and Lewis also contain livestock farms. The area is vitally important as a source of timber. Steep terrain, wet climate, short growing seasons and heavy forest vegetation are main handicaps for agriculture.

Columbia Basin

A low plateau of old lava rocks covered with stream and wind-deposited soils extends in a series of plains, ridges, coulees and hilly from the Cascades to the eastern Washington border. The area is basin-like in structure, being higher around its margins and sloping inward to low and level central plains. It has been sharply eroded by the Columbia River and its interior tributaries, the Snake, Yakima, Palouse and Spokane Rivers. The basin has sub-areas created by crustal movements and erosion.

The Yakima Folds are a series of hilly ridges extending from the Cascades eastward into the lower part of the basin. The Yakima and Columbia Rivers have cut gaps through the ridges and built up plains in the troughs between them. The rich, alluvial plain of the Yakima River is an important irrigated valley.

The Waterville Plateau is a tableland of thin soils overlaying basaltic rock at an elevation of 2,500 to 3,000 feet. It has gorges cut by the Columbia River and ancient glacial outwash streams once flowing in Moses and Grand Coulees. It is too high for irrigation and is used for dryland grain and livestock farming. The high plain is often called the Big Bend country.

The Channelled Scablands is a belt of dry terrain carved by ice-age rivers into a series of coulees. Bare rock is exposed in the coulees. Small plateaus between the old river channels have thin soils used for dryland farming. The Grand Coulee of this region has been developed into a major irrigation reservoir.

The Palouse Hills consist of fertile deposits of wind-blown soil overlaying basaltic lava flows. After being deposited in large dunes, the formation was reshaped by streams into an intricate pattern of low, rounded hills which are tilled for wheat, barley and legumes. The hills receive 16 to 25 inches of rainfall and have deep, porous and fertile soils. It is one of the richest farming areas of the Pacific Northwest.

The Central Plains are low and relatively level expanses of soil, deposited by old streams crossing the Channelled Scablands and later by the flooding of the Yakima, Columbia, Snake and Walla Walla Rivers. Climate is desert-like (6-12 inches of precipitation per year). The lower lands of the area, the Quincy and Pasco Basins and the Walla Walla Valley, are irrigated. Quincy Basin is a new irrigation area watered by Grand Coulee Dam.

Agricultural handicaps in Columbia Basin regions are mainly found in its dry, continental climate. Large irrigation systems built since 1900 have overcome much of the need for water on rich valley and basin soils. Dryland farming in higher areas is practiced widely, although occasional variations in rainfall, lack of snowfall, winter-kill, water and wind erosion inflict damage to field crops and to livestock ranges.

Okanogan Highlands

A portion of the Rocky Mountains, consisting of well-eroded old granites, lavas and sedimentary rocks, extends across north central Washington. These are the Okanogan Highlands, the state's richest mineral area. Summit levels reach 4,000 to 5,000 feet with peaks exceeding 7,000 feet. Prominent north-south valleys are occupied by irrigated tree fruit and livestock farms. These are the Okanogan, Sanpoil, Kettle and Colville Valleys. The Columbia River gorge through the Okanogan Highlands is occupied by the large man-made lake behind Grand Coulee Dam--Roosevelt Lake. High and wetter portions are forested with pine and larch, and are managed for timber and for livestock ranges by the United States Forest Service and the Bureau of Indian Affairs. Cold winter temperatures, short growing seasons, dry valley climates and distance from markets are farming handicaps.

Selkirk Mountains

The Selkirks, a range of the Rocky Mountain system, extend into the northeast corner of Washington. The rocks are old mineralized granites and metamorphics reaching elevations of over 7,000 feet. The Pend Oreille River Valley

at the base of the Selkirks is an agricultural area of narrow bottom lands settled by livestock farmers. Nearly all of the uplands are in Kaniksu National Forest. While climate is cool and growing seasons are short, the Pend Oreille Valley has an advantage of being closely located to the Spokane metropolitan market area.

Blue Mountains

The Blue Mountains are an uplifted and eroded plateau extending into the southeastern corner of Washington. The strata are mainly ancient crystalline rocks which contain some minerals. The highest point of the mountains in the Washington section is Diamond Peak (6,401 feet), on the divide between the Grande Ronde, Tucannon and Touchet Rivers. These rivers, and the Walla Walla River, have cut valleys into the plateau. Extensive pine forest and grassland areas are in the highlands within Umatilla National Forest, where rainfall is 30 to 40 inches. The Snake River has cut a deep valley and gorge across the lower parts of the mountains. The area is well developed agriculturally around its northern foothills where wind-blown soils are deep and irrigation systems are used. The Walla Walla and Tucannon Valleys are rich grain, legume and livestock areas grown under irrigation and by dry farming. Grazing is an important use of the high lands by livestock ranchers in the upper valleys.

Topography of Mason County

Mason County is located in two of the major physiographic provinces of western Washington--the Puget Sound-Willamette Lowland and the Olympic Mountain section of the Coast Ranges. Topography is extremely varied. Sea level beaches on Hood Canal and Olympic Mountain elevations of over 6,000 feet are within less than 20 miles of each other.

The glacial drift plain area of the Puget Sound-Willamette Lowland roughly includes the eastern third of Mason County. It is a varied and scenic forested area of glacial moraines, glacial lakes, sloping lands indented by narrow inlets of Puget Sound and a long bent arm of the sea called Hood Canal. In relatively recent geological history, thick ice sheets of the Puget Sound Glacier lay over this area. As the last ice sheet receded about 20,000 years ago it left thick, uneven deposits of clays, sands and gravelly material. Numerous lakes and ponds were formed in low places in the glacial deposits. Alpine glaciers from the Olympic Mountains also deposited large terminal moraines along Hood Canal and the upper Skokomish River. Hood Canal is an arm of the sea which was once an ancient river valley tributary to a larger river which once drained the Puget Sound Lowland to the northward.

The Olympic Mountains and foothills are a rough and heavily forested region with no agriculture and only a few logging camps. These mountains rise abruptly above Hood Canal and the Skokomish Valley. Mount Washington, elevation 6,250 feet, is the highest point in Mason County. In recent years the area has been penetrated by logging railroads and forest access roads. A major development was the building of Cushman Dam on the North Fork of the Skokomish River by the City of Tacoma. This hydroelectric development created a large man-made reservoir called Lake Cushman within the Olympic foothills. The Olympic Mountain area is rough with numerous, narrow stream canyons. With the exception of its barren, alpine glaciated crests, it is all under forest land and wilderness

land management by the federal government, the state government and private tree farms. One of the largest private tree farms in the state lies in the foothill zone of southwestern Mason County.

The glaciated lowland area is now the main inhabited zone of Mason County. Elevations in this eastern third of the county are from sea level to over 900 feet at the tops of the higher glacial moraines. Glacial uplands rise abruptly 200 feet and more from the beaches of Puget Sound inlets and Hood Canal. The Skokomish River is the county's major drainage system and is slowly filling in southern Hood Canal with its sediments from the Olympic Range. The lower Skokomish Valley is a tidal mud-flat area. Harstone Island, Stretch Island and Reach Island are glacial moraines in Case Inlet of Puget Sound. Major glacial lakes are Cranberry, Mason and Spencer. Most of the settlements in Mason County are ports and early sawmill sites at tidewater on Hood Canal, Case Inlet, Eld Inlet, Totten Inlet, Hammersley Inlet and Oakland Bay. Shelton, a lumber port on Oakland Bay, is the major populated place in the county.

Land Classification and Soils

The land of Mason County varies greatly from place to place. A glacial drift plain of rocky and sandy material with numerous lakes, bogs and localized clay and peat pockets characterized the Puget Sound-Hood Canal Lowland. The western Olympic Mountain region has rough terrain with a few narrow valleys. In general, good farming land is limited. Of a total land area of 618,800 acres within the county boundaries, only 9,000 acres were utilized for crops and 18,000 for pasture during 1954, and less than 8 percent of the county was in farms. The land can be divided into three general classes of economic land use.

The best farming districts are Class I and II lands localized to three districts. Skokomish Valley, in central Mason County on Hood Canal, is the largest district with Class I and II lands. This is a level, tidewater delta area with deep deposits of silty, sandy and clay alluvial soil deposited by the Skokomish River, where improved by drainage it is an important dairy and livestock area with over 4,000 acres of good bottom land used for hay and pasture. Much of this section is within the 3,052 acre area of the Skokomish Indian Reservation at the mouth of the Skokomish River. Kamilche Valley, in southeastern Mason County, is a smaller area of about 1,000 acres with good bottom land soils. A third good land district is in some upper Chehalis River tributary valleys of southwestern Mason County.

Most farm land falls into Classes III and IV which are only fair for crops and pasture. These consist of glacial plains and wooded prairies with various degrees of slope. About one-fourth of the county has this type of land which is gravelly, sandy and dotted with small lake plains of clay and peat. This land makes up most of the Puget Sound and Hood Canal lowlands extending from the Kamilche Valley and Shelton districts to Grapeview and Belfair. Most of it is out-over land with young regrowth forests. Farm forest products, fruit and grapes are grown on this land in northeastern Mason County.

Well over two-thirds of Mason County is rough, hilly and mountainous land made up of Olympic Mountain, steeply sloped glacial moraines and the shoreline bluffs. Classified as V, VI and VIII land these types are capable only of some pasture and are best suited for management as forest lands. All these lands are forested with the exception of some recent cut-over areas and rocky, barren

areas within the higher Olympics.

In general, most of the soils are of forest origin and are deficient in lime, phosphorous and other soluble minerals. Most soils are acid and require applications of lime for best productivity. Heavy rainfall leaches out calcium and phosphorous and these elements are deficient in new croplands brought under cultivation.

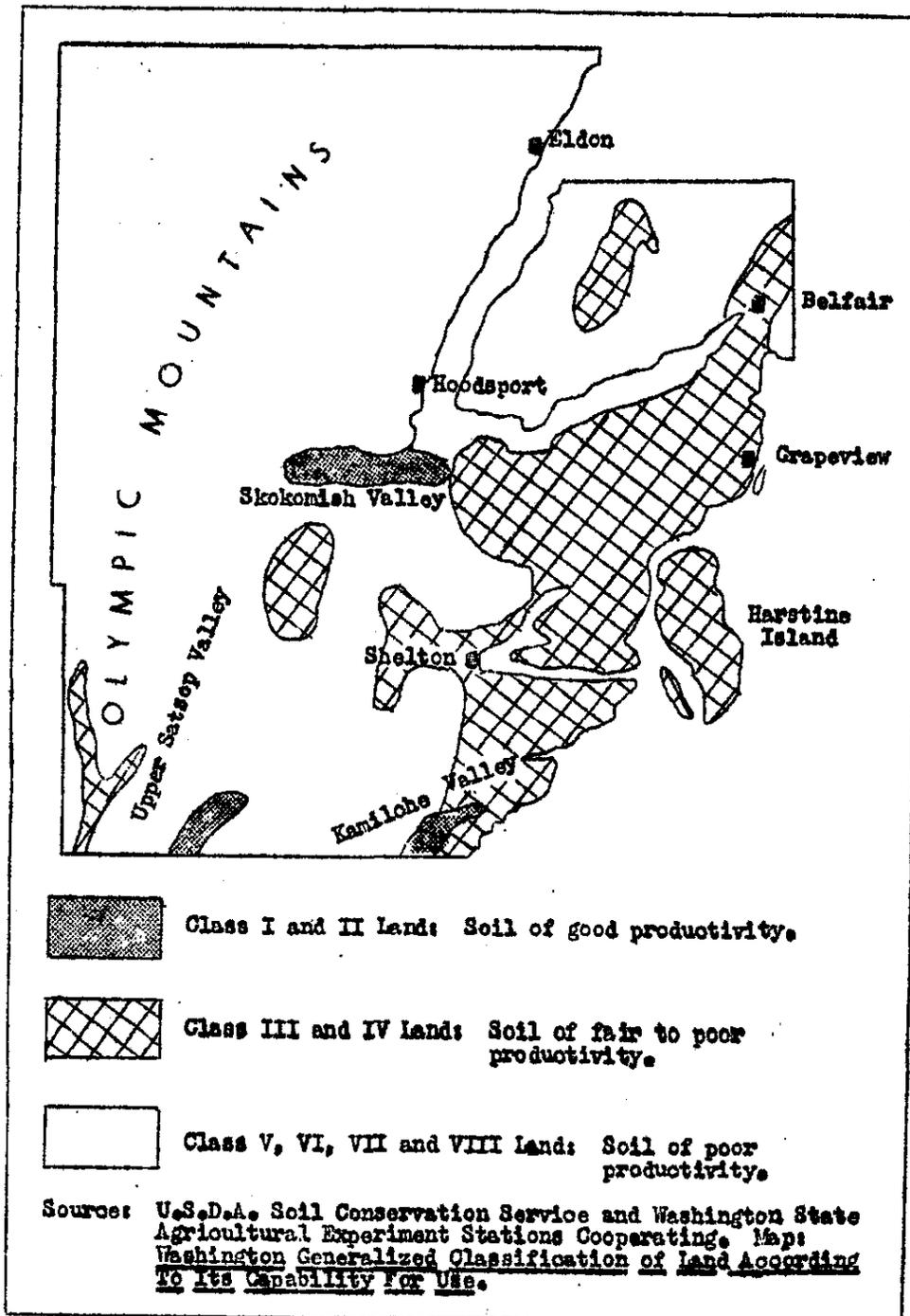


Figure 6.- General Quality of Land in Mason County

Climate

Mason County is located in the West Coast Marine Climatic Region of North America--a zone of mild, long, wet winters and cool, short, dry summers which is found along the coast from southeastern Alaska to northern California. This climate is influenced by the prevailing air flowing inland from the oceans. Mild, humid Pacific Ocean air is over the area most of the year. In the case of Mason County, prevailing westerly winds rising over the Olympic foothills and mountains brings a long, cloudy, wet season for about nine months of the year. Summers are generally fair and mild in temperature and the warming ocean air drops only a light rainfall during the summer season.

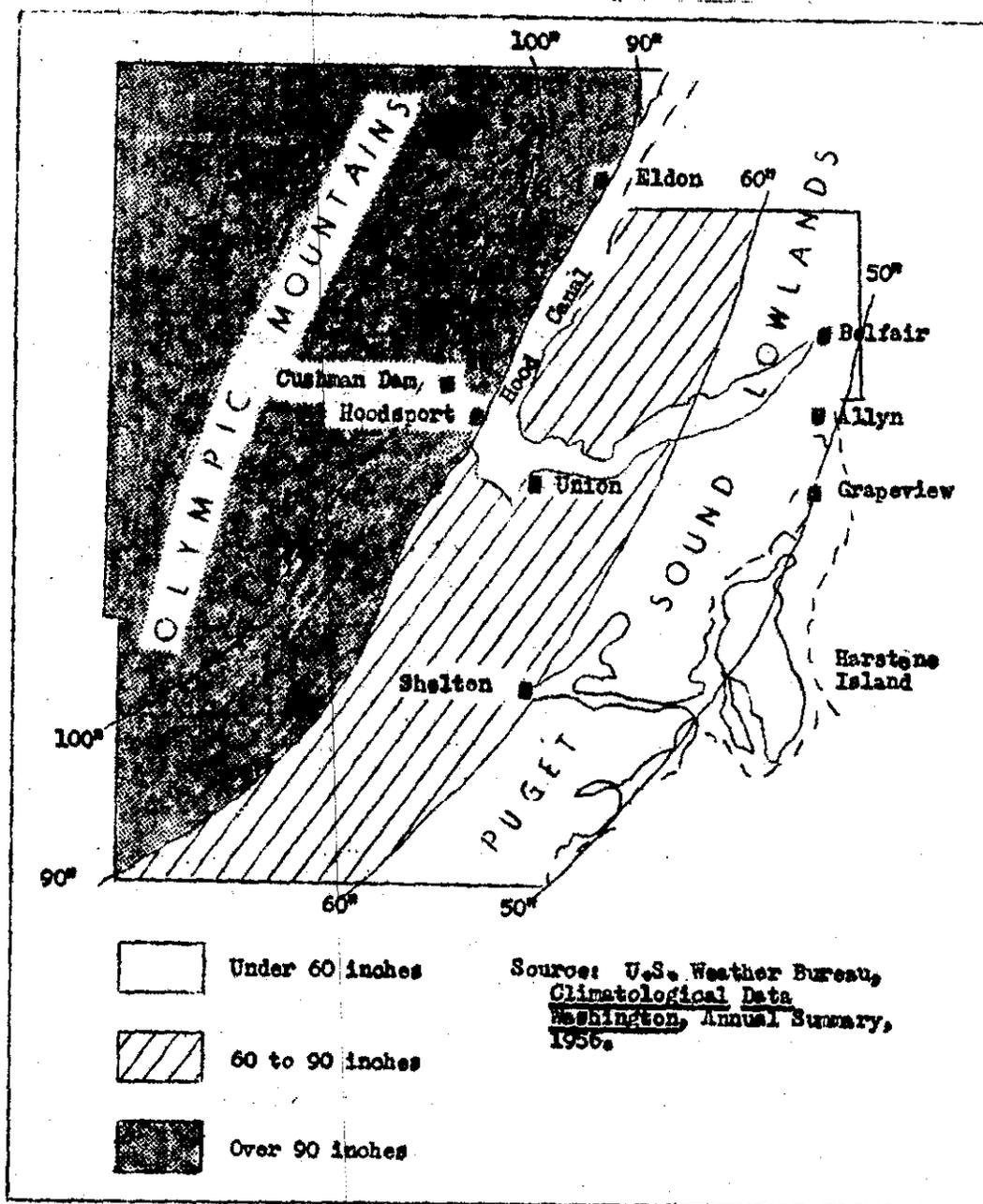


Figure 7.- Distribution of Precipitation
Mason County

Precipitation in the form of rain and snow is heavy over most of the county ranging from 50 inches in the eastern Puget Sound Lowlands to well over 100 inches in the Olympic Mountains. Weather Bureau data from Cushman Dam, Shelton and Grapeview indicates that there are three general precipitation zones. The driest zone is the Puget Sound Lowlands in the Shelton, Grapeview, Harstine Island, Allyn and Belfair districts where rainfall ranges from less than 50 inches to 60 inches a year. This zone is in the lee of the Olympic Range. Northeastern Mason County at the head of Hood Canal and Case Inlet in the Grapeview and Belfair districts is driest although there precipitation is about 50 inches. A foothill belt westward of Shelton and along Hood Canal is quite humid with precipitation ranging from 60 to 90 inches. The higher Olympic Mountain belt is extremely wet from heavy winter rains and snowfall. Moisture exceeds 100 inches at Cushman Dam at the 760 foot elevation and is estimated at nearly 130 inches in the alpine ridges looming above Lake Cushman and Hood Canal. This portion of Mason County is in the Olympic Mountain province--the wettest region in continental United States. Wet conditions have created dense growths of forest and woodlands and also influenced the type of agriculture.

Moisture is received in a distinct seasonal pattern. October to April is extremely cloudy and wet as Pacific Ocean westerly winds and maritime storms pass over the mountains and lowlands causing heavy showers or steady rains as the air is forced upward. Winter rains and snows bring from 8 to 16 inches of moisture per month. May through September is a dry season as westerly winds are replaced by northwesterlies with stable, cool, dry air. Rainfall falls off to less than 2 inches per month, top soil gets dry and forest fire hazards develop. Sunshine prevails and a short period of good growing and harvesting weather helps farmers raising forage crops.

Table 6.- Precipitation for Selected Stations by Months
Mason County

Station and Elevation in Feet	Average Monthly Precipitation (in inches)												Annual Total (inches)
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Cushman Dam (760)	16.39	12.13	9.91	5.88	3.47	2.35	1.38	1.34	3.75	9.65	15.18	18.68	100.1
Grapeview (20)	8.29	6.77	5.4	3.04	1.95	1.60	.81	.93	2.05	5.11	7.64	9.49	53.08
Shelton (22)	10.25	8.19	6.51	3.68	2.23	1.68	.88	1.03	2.40	6.01	9.19	11.92	63.97

Source: U.S. Weather Bureau: Mean Temperature and Precipitation
Washington, Bulletin issued October 1957.

Temperatures are mild without uncomfortable and destructive extremes. Over maritime lowlands along the inhabited shores of Hood Canal and Puget Sound annual temperature averages range between 37 degrees in mid-winter to about 65 in mid-summer. Warm, growing weather is lacking for many crops, but the uniform coolness is good for pastures and hay. Cold waves of continental air are infrequent, and extreme heat of over 100 degrees is rare. Killing frosts from cold air drainage from the Olympics or from heat radiation on calm, clear nights occur in some of the low pockets near Puget Sound in spring and fall. Grapeview on the Sound normally has a growing season of at least 215 frost free days but growing conditions are handicapped by the lack of warm nights during the summer season. During a 24 hour summer period temperatures will range from 80 degrees at mid-day to about about 55 degrees at midnight.

Table 7.- Temperature Extremes, Dates of Killing Frost
Mason County

Station	Temperature Extremes Recorded (degrees Fahrenheit)		Killing Frost Average Dates	
	Coldest	Hottest	Last in Spring	First in Fall
Cushman Dam	6	101	April 10	November 6
Grapeview	10	102	April 15	November 9
Shelton	14	102	May 1	October 23

Source: U. S. Weather Bureau

Table 8.- Temperatures For Selected Stations, By Months

Station and Elevation in Feet	Average Temperatures (in degrees Fahrenheit)												Annual Average
	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	
Cushman Dam (760)	37.6	42.8	49.8	49.8	55.8	59.5	64.4	64.6	60.0	53.4	54.1	40.0	51.0
Grapeview (20)	39.0	45.0	45.6	50.2	56.2	60.7	65.0	65.2	60.9	52.5	54.5	43.1	52.0
Shelton (22)	38.5	41.0	50.7	56.2	60.1	64.4	64.4	59.6	53.5	49.9	40.6	41.2	51.5

Source: U.S. Weather Bureau, Climatological Data,
Washington, Annual Summary, 1956Forests, Land Ownership and Wildlife Resources

Mason County is part of the heavily forested Olympic Peninsula and its timber resource plays a dominant role in the county's economy. Most Mason County farmers participate in industrial and farm forestry and many of them are owners of part of the forest resources found in this area. Part of the county is within Olympic National Park, Olympic National Forest and in much of the remainder large tree farms owned by lumber and paper companies. Dense forests of Douglas fir, hemlock, true firs and red alder cover much of the gravelly uplands and mountains. Lumber, paper and other manufactured forest products keep Mason County important in forest industries of the state. The lumber output of Mason County has ranged from 360 million board feet in 1941 to 152 million feet in 1954 produced by 7 to 10 mills in the Shelton and Hood Canal districts. ^{1/} In 1954 the lumber output was fifth highest in the state partly because logs are brought from other Olympic Peninsula counties for milling. The Mason County log cut in 1954 was 100 million board feet, thirteenth highest in the state.

According to a recent Forest Service survey in 1953, 94 percent of Mason County land is classified as forest. ^{2/} There are 577,000 acres of forest land of which 520,000 acres carries commercial timber, or is stocked with regrowth timber. Young timber not of sufficient size for sawmilling makes up 67 percent

^{1/} West Coast Lumbermen's Association, 1953-1954 Statistical Year Book, 1410 S. Morrison St., Portland 5, Oregon.

^{2/} U.S. Forest Service, Pacific Northwest Forest and Range Experiment Station, Portland, Oregon. Forest Statistics for Mason County, Wash., July 1953.

of the forests, while 32 percent is mature or commercial saw timber. Trees classed as commercially valuable contained 5,651 million board feet in 1953 divided into the following species: Douglas fir (3,140 million feet) and western hemlock (1,675 million feet) with the remainder in minor species such as red cedar, sitka spruce, white pine, silver fir, red alder, big leaf maple, cottonwood and madrona.

Forest ownership is about evenly divided between public and private owners. The Federal Government owns and manages 50 percent in national parks and forests and Indian lands. Private owners including timber and lumber companies, railroads and farmers control 46 percent of the standing timber. State school land timber accounts for 4 percent of the total.

Land ownership including forest and non-forest land is divided into three major types. Federal lands include 168,499 acres managed by the Forest Service, Park Service, Bureau of Indian Affairs, Navy and Bureau of Land Management. State ownership includes 40,105 acres of school, university and tax delinquent lands. Private lands including all farms, company holdings and private real estate amounts to 410,285 acres.

Wildlife resources of the forest land are valuable in the rural economy. The mountainous and seashore environment supports a varied list of animal species. About 50 lowland and mountain lakes are stocked with trout. There are also numerous mountain streams in the Olympics for fishing. Salt water fishing and shell fish digging are popular recreational pursuits on Hood Canal and the Puget Sound inlets. Washington State Game Department figures for 1955 show that hunters bagged 1,774 deer and 159 elk in the uplands and mountains of Mason. Trappers caught 483 muskrats, 68 mink, 193 raccoon and 23 otter from lakes, streams and marshlands during the 1955-1956 season. 1/

1/ Washington State Game Department, Olympia, Washington. Quarterly Game Bulletins, Quarterly 1955 and 1956. Report of Trappers' Catch of Fur Bearers 1956.